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## The Time Telegraph Company's System.

BY CHARLES S. H. SMALL.

As soon as the early discoveries in electricity and electro-magnetism were turned to practical uses for telegraphy by the improvements in insulation, machinery and galvanic batteries which rapidly followed, it was observed by several ingenious men that this new force offered in its marvelous celerity, its certainty of operation and in the simplicity of the mechanism required, a means peculiarly adapted for the transmission of standard time to places at a distance. Various applications of the idea, more or less successful, followed. Among the most important is the determination of the longitude of any point on the earth's surface which may be connected by a telegraph wire with any other point whose longitude is definitely known. The difference between the local times at any two places is the difference in their longitudes. The problem of terrestrial longitude, then, is to find at any instant of absolute time the difference of the local times of two places; and it requires, 1st, the determination of the local time at each place, and 2d, the comparison of these local times at the same instant. The first requirement is easily filled by observations of the sun or the transit of a star; and for the second, it is the result of experience that of all methods of determining differences of longitude that by telegraphic signals is the simplest and best, there being no difficulty in securing accuracy to the $\frac{1}{100}$ of a second.

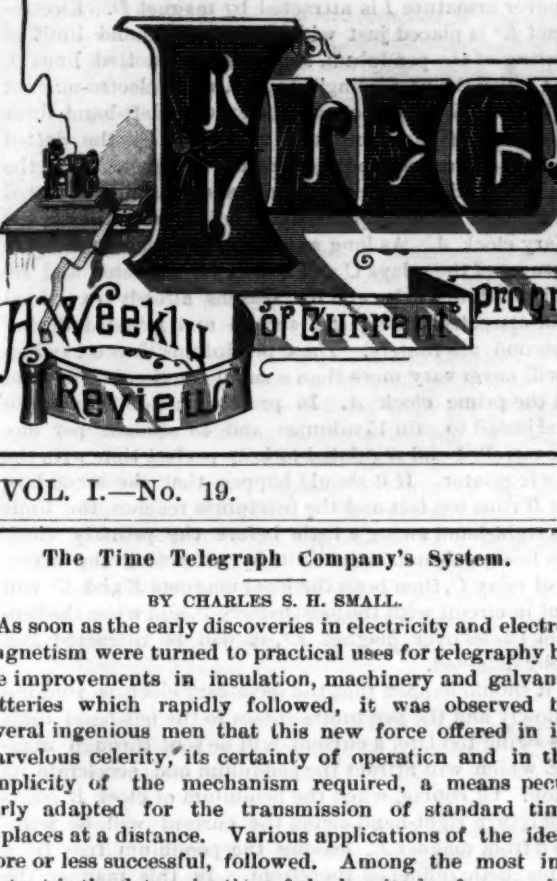

FIG. 1.

This application, although of vast importance as regards the safety of our ocean commerce (the whole practice of navigation being built upon this principle) is small in comparison with the vast field open for the use of electricity as a time-keeper in the various wants of our modern domestic, social and commercial life. In the latter field, time-keepers scattered over any extent of territory are required to be kept in complete accord to give the exact mean time of the locality which maintains the standard time for the surrounding territory. For this purpose electric clocks have been invented, and recent developments in this art have rendered the subject not only very important from a commercial point of view (since large rewards await successful pioneers in the field), but extremely interesting to the man of science and to the electrical engineer.

Electric clocks may be constructed on one of the two following principles: 1st. Electricity is the motive power which propels the clock; 2d. Power is obtained from weights or springs, and electricity is used for controlling or regulating the motion.

In the system used by the Time Telegraph Company, the former principle is employed, as it offers great advantages in cheapness, simplicity and exactness. It will readily be understood that a clock propelled by the practically instantaneous operation of the electric current, say once per minute, must be exactly right once per minute, and therefore indicates true standard time continuously in practice.

It is the purpose of this article to fully describe the details of the practical application of these principles in the system under discussion. The general features of the system are as follows: A prime electric regulator clock, which is maintained exactly correct by comparison with the standard of an observatory, synchronizes by means of electricity, a number of precisely similar electric regulators, each of which furnishes time to the subscribers within its district. This district consists of a single city block, or even one large building containing a large number of offices, such as are now so common in New York and other large cities. The instruments furnished to the subscribers usually consist of clock dials whose hands are propelled by electro-magnets and a simple mechanism to be described hereafter. The district regulator sends an electrical impulse once per minute. This impulse operates the dials, which require for their movement neither springs nor weights, and consequently never need winding, the machinery of the dial being thus reduced to the lowest possible degree of simplicity. As the largest district which one regulator controls consists of a city block, the risk of interruption to the lines is reduced to a minimum. Neither house-top nor pole-lines are required in this system, the wires being attached to the sides and walls of buildings, principally within court-yards, skylights and well-holes, and they *never cross the streets.* This system has been copyrighted by the company.

The general subject naturally divides itself under four heads, namely: 1st. The regulators: 2d. The synchronizing arrangement; 3d. The dials; 4th. Special engineering devices for the maintenance of the system in a proper state of efficiency.

### THE REGULATORS.

Before describing the special apparatus used, it will be necessary to preface the description with a few remarks on ordinary regulators, in order that the undeniable advantages embodied in the new system may be properly understood and appreciated.

Suppose a seconds pendulum, that is, a pendulum 39.1 inches long from the point of suspension to the center of the bob, to be set swinging by an impulse from the finger; it will perform one complete oscillation, from the extreme limit of its swing on one side of a vertical line, to the extreme limit of its swing on the other, in one second of time. After a certain time has elapsed, the pendulum will gradually shorten its arcs of vibration and at last will stop altogether. This result is owing to the resistance of the air. In ordinary seconds clocks the pendulum receives an impulse once per second, which is sufficient to overcome the retarding influences of the cause mentioned, as well as that of the irregular or imperfect action of the train of wheel-work. This accelerating impulse originates in a raised weight or a coiled spring, acting through a train of wheels, the last of which is an escape-wheel with 60 teeth. An anchor, either attached to or operated by the pendulum, vibrates from side to side as the pendulum swings, and allows the wheel to escape, one tooth at a time; so that when the pendulum reaches the limit of its left-hand oscillation, the wheel escapes one tooth, and when it reaches the limit of the next oscillation, the wheel escapes another tooth. This serves two purposes; the first being that the escape-wheel, by proper gearing, indicates time by the hands in front of the dial; and the second being that the pendulum is pushed a little in the direction of its next oscillation by the escaping tooth, with sufficient force to overcome the sum of all the retarding influences. Now this system has many defects for a true timekeeper, chief among them being the fact that the pendulum has varying work to do and receives varying impulses, owing to the varying condition of the machinery, such as expansion and contraction of the gear work, friction, etc.

The inventor of the regulator about to be described has solved the problem of making a perfect time-keeper by taking the bold and novel step of giving the pendulum no work at all to do. In this regulator, the pendulum has nothing to do but to swing, its function being sole that of accurately dividing time into seconds. It receives its acceleration regularly and always with the same power; it is wholly free from friction, except that caused by the atmosphere, and is entirely disconnected from the time-indicating machinery of the clock, thus fulfilling the ideal conditions of a perfect time-keeper.

The regulator shown in Figs. 1 and 2 is the invention

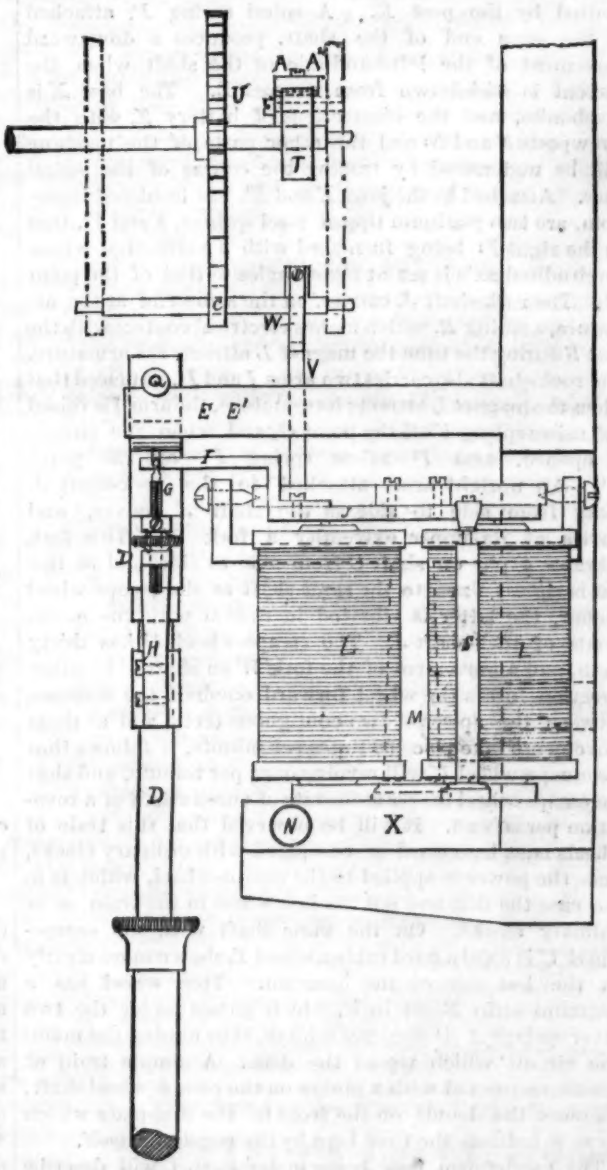

FIG. 2.

of Mr. Augustus S. Crane. Another form of the apparatus will be alluded to further on. Fig. 1 is a view of the regulator and its companion clock-work, with the front plate of the latter removed, while Fig. 2 shows a right-hand side view of the same apparatus. *D* is the pendulum rod (composed of concentric cylinders of brass and zinc encircling an iron shaft for compensation of variations of temperature), attached by a thin, flat, flexible strip of steel to the block, through which passes the cylindrical suspension bar *Q*. This bar rests in semi-circular cavities in two jaws *E* and *E*$^1$, which form part of the casting which constitutes the frame-work of the apparatus. As this bar is simply laid in these cavities and is held there by its own weight, it follows that the pendulum and its accessories may be quickly and easily removed by simply lifting it out of these supports. Just below the lower block, into which the flat steel strip is fastened, a collar *H* and *H*$^1$, carrying the two quadrants, encircles the cylindrical portion of the pendulum rod, and is rigidly attached

thereto. The quadrant *H* carries at its upper extremity an adjustable rubber-tipped screw *G*, while the other quadrant is armed with an adjustable screw $G^1$, carrying a platinum knife-edge, the longitudinal axis of the latter being adjusted at right angles to the line of vision. By a peculiar arrangement of the adjusting screws on the last-named point, the act of raising or lowering the screw does not vary the direction of the longest axis of the knife-edge. The lower end of the pendulum rod carries the usual bob

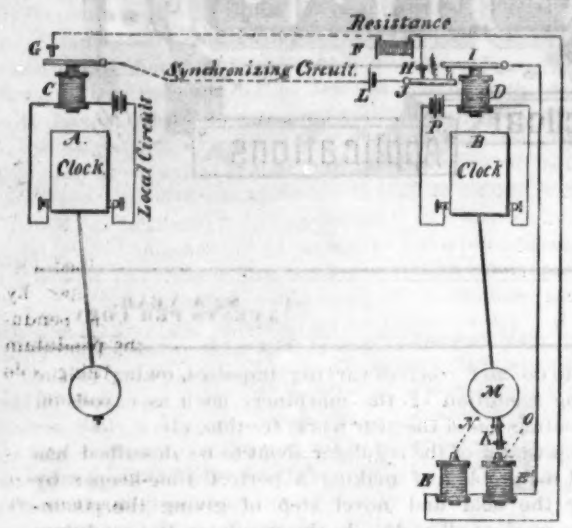


FIG. 3.

and adjusting screws for raising or lowering the center of oscillation, and this concludes the description of the pendulum and its attachments. Behind the pendulum, a rock-shaft *J*, pivoted on the post *M*, carries on one arm an armature placed immediately above the electro-magnet *L*, of which only one spool is shown in Fig. 1, and on the other side its movement in the opposite direction is limited by the post *K*. A spiral spring *P*, attached to the same end of the shaft, produces a downward movement of the left-hand side of the shaft when the current is withdrawn from magnet *L*. The base *X* is of ebonite, and the connections of battery *Z*, with the screwposts *N* and $N^1$ and the other parts of the machine will be understood by tracing the course of the spiral lines. Attached to the jaws *E* and $E^1$, but insulated therefrom, are two platinum tipped steel springs, *F* and $F^1$, that on the right $F^1$ being furnished with a knife-edge whose longitudinal axis is set at right angles to that of the point $G^1$. The rock-shaft *J*, carries, on the same end as the armature, a spring *R*, which makes electrical contact with the post *S* during the time the magnet *L* attracts the armature. The rock-shaft also carries two arms *I* and $I^1$, so placed that when the magnet *L* attracts its armature, the arm *I* is raised and raises spring *F* off the point *G*, and when the circuit is opened, arm $I^1$ raises spring $F^1$ off the point $G^1$. An upright arm attached to the rock-shaft *J*, rocks from side to side as the shaft *J* moves, and carries at its upper extremity a fork *W*. This fork vibrates a pin on shaft *C* from side to side, and as this pin is rigidly fixed to the same shaft as the escape-wheel anchor, the latter is vibrated in unison with the movements of rock-shaft *J*. The escape-wheel *U* has thirty teeth, and a movement of the fork *W* on shaft *V* in either direction forces the wheel forward one-half the distance between the apices of two contiguous teeth, and as these movements take place 60 times per minute, it follows that the escape-wheel *U* will revolve once per minute, and that the escape-wheel moves at the rate of one-sixtieth of a revolution per second. It will be observed that this train of wheels runs backward as compared with ordinary clocks, since the power is applied to the escape-wheel, which is in this case the first and not the last wheel in the train, as in ordinary clocks. On the same shaft with the escape-wheel *U* is fixed a hard rubber wheel *T*, shown more clearly on the lest side of the diagram. This wheel has a platinum strip *B* set in it, which passes under the two silver springs *A* $A^1$ once per minute, thus closing the main-line circuit which works the dials. A simple train of wheels, connected with a pinion on the escape-wheel shaft, operates the hands on the front of the dial-plate which serve to indicate the time kept by the regulator itself.

The mechanism now being understood, I will describe the course and functions of the current from battery *Z*, which serves as the motive power for the pendulum and train, it being, of course, understood that there are no weights or springs to this clock.

When the pendulum swings to the right, the two knife-edged platinum points $F^1$ and $G^1$ first come in contact, and the spring $F^1$ is raised off arm $I^1$, thereby closing a circuit through magnet *L*, which causes the armature that formerly held spring $F^1$ up to be attracted, thus allowing impulse-spring $F^1$ to fall and push the quadrant $H^1$ through a space equal to the distance through which the armature fell. As this space is greater than the space through which the quadrant $H^1$ had lifted the impulse-spring $F^1$, it follows that the pendulum receives an acceleration of force, and it is the constant and regular repetition of this force, applied at precisely the proper moment, which overcomes the atmospheric retardation, and causes the pendulum to keep swinging. When the armature falls it closes the circuit through its own magnet by another route, through post *S*, spring *R*, shaft *J*, arm *I* and spring *F*, thereby keeping the armature attracted to the magnet even after the knife-edges $F^1$ and $G^1$ have been separated by the returning swing of the pendulum. The circuit will remain closed until the pendulum swings over to the left-hand side far enough for the rubber tipped screw *G* to lift the spring *F* off arm *I*, which will occupy precisely one second of time. When the spring *F* is lifted off the arm *I*, the circuit through magnet *L* will be broken, and the armature will be released, the retracting spiral-spring will then operate to draw down the left-hand end of the rock-shaft and the arm *I* will be withdrawn from the downward path of spring *F*, which follows the pendulum in its right-hand swing, and in falling through a larger arc than that through which the pendulum had lifted it, will give the latter the necessary additional impulse to swing to the extreme limit of its right-hand swing. The circuit will now remain open one second, until the pendulum reaches its limit of motion on the right-hand side, when the circuit will be closed at points $F^1$ and $G^1$, and the operation already described will be repeated.

In another form of the regulator which the company controls, the spiral spring *P* and post *K* are suppressed, and another magnet in the same local circuit as magnet *L* is substituted to perform their functions. The connections are so arranged that the current is automatically directed first through one magnet and then through the other, in succession, and no current passes through either of the impulse springs while the spring is in operation, so that any possible thermal effects of the current in these springs

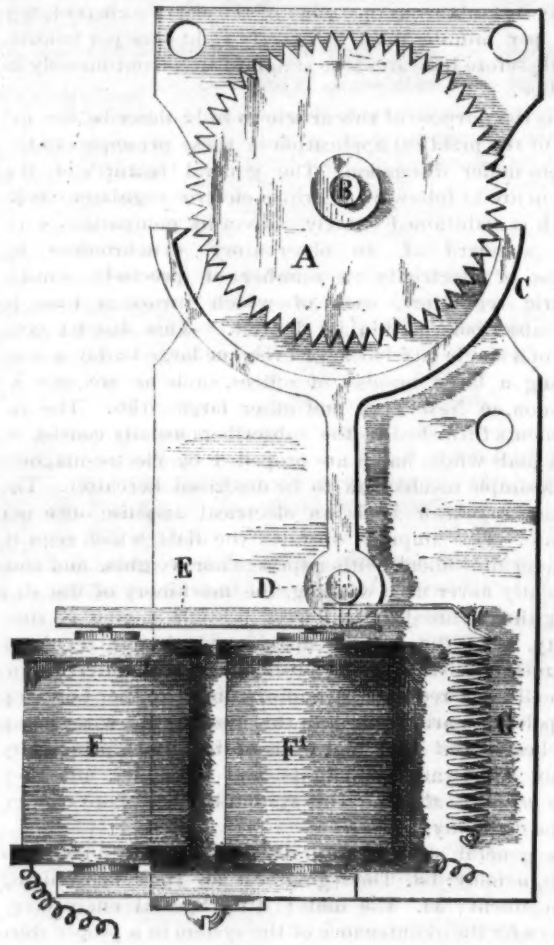


FIG. 4.

can have no possible effect on their tension [or on their power when applying the push to the pendulum.

THE METHOD OF SYNCHRONIZING THE REGULATORS.

In Fig. 3, *A* represents the prime regulator of the system (it being understood that one or more are kept in reserve ready for use in case of accident to the regulator in use), and *B* represents one of a series of regulators which are automatically synchronized with the former. The two regulators *A* and *B* are of the same pattern and shape, and have the same local electrical connections as that shown in detail in Figs. 1 and 2. In the diagram, the dotted lines represent the (metallic) synchronizing circuit, while the straight lines indicate as much of the connections of the regulators as is necessary to understand the action of the synchronizing apparatus.

This apparatus will be clearly understood by the following description: *C* and *D* are relays whose spools are connected respectively in the local circuits of the clocks to which they are attached; *C* being in the circuit of the primary, and *D* being one of a different pattern of which a similar sample is attached to each of the secondary or regulated clocks. The armature lever of *C* closes a metallic main circuit on its upper or back contact; screw *G* connecting with the synchronizing relays of all the secondary clocks; but it will be observed that this synchronizing circuit can never be entirely broken by the relays at the secondary clocks, since it is shunted around the secondary relays through a resistance *F*, when the relay *D* releases its armature. The spools of relay *D* are in the local circuit of the regulated clock *B*, consequently when the pendulums of the prime clock *A* and the regulated clock *B* vibrate in unison, the two relays *C* and *D* operate their armature levers simultaneously. Each secondary pendulum carries a soft iron armature *K*, and placed beneath the arc of the pendulum's vibration are two electro-magnets *E* and $E^1$, which are placed in the synchronizing circuit whenever armature *I* is attracted by magnet *D*. Electro-magnet $E^1$ is placed just within the right-hand limit of the swing of the pendulum, shown by the dotted lines *O*, and is called the "retarding" magnet, while electro-magnet *E* is placed just on a line with the extreme left-hand limit of the swing of the pendulum, as shown by the dotted lines *N*, and is called the "accelerating" magnet. When the secondary clocks are set up their pendulums are adjusted and arranged to swing precisely in unison with that of the primary clock *A*. As long as this synchronism exists the armatures of the relays *C* and *D* will be attracted and released simultaneously, and for reasons already explained will be attracted during one second and released during one second alternately. These pendulums thus set swinging will never vary more than a small fraction of a second from the prime clock *A*. In practice a 4-lb. pendulum bob adjusted to gain 15 minutes and 48 seconds per day was controlled and regulated to keep perfect time with the prime regulator. If it should happen that the secondary clock *B* runs too fast and the pendulum reaches the limit of its right-hand swing a little before the primary clock opens the synchronizing circuit by attracting the armature of relay *C*, then both the local magnets *E* and $E^1$ will be put in circuit with the local battery *P*, and when the pendulum passes over magnet $E^1$, it will be attracted and thereby detained.

If it should happen that the secondary clock is running too slowly and the pendulum comes to the left-hand limit of its swing too late, a current will be sent through magnet *E* which will attract the pendulum and accelerate its motion. Of course, when the pendulum of clock *B* starts on its return right-hand swing the current will be withdrawn from magnet *E*, leaving the pendulum free from any magnetic influence therefrom. In this manner the pendulums of any number of secondary regulating clocks may be kept swinging in exact unison with the pendulum of the prime regulator. These secondary regulators furnish the electric impulses which propel the dials, the latter being, generally speaking, the instrument furnished the company's subscribers for indicating true time.

THE DIALS.

This apparatus is shown in Fig. 4, the front plate being removed to show the construction. *A* is an escape-wheel with 60 teeth; *B* is the escape-wheel pivot; *C* is the escapement anchor; *D* the pivot of the anchor; *E* the armature of electro-magnet *F* and $F^1$, and *G* a spiral retracting spring. A simple train of wheel-work communicates the motion from escape-wheel *A* to an hour-hand placed in front of a clock-dial not here shown. When a current passes through magnet *F* $F^1$, and the armature *E* is thereby attracted towards the magnet, the right-hand anchor pallet will move toward the left hand of the spectator, and in passing between two of the teeth of the escape-wheel will revolve the latter a distance equal to half the space between the summits of two contiguous teeth on the wheel, or, in other words, one one-hundred-and-twentieth part of a revolution. When the current is withdrawn the retracting spring *G* will cause the left-hand pallet of anchor *C* to come between two of the teeth on the other side of the wheel, and will thus rotate the wheel for the same space as before described and in the same direction, the total movement thus produced, by a closing and opening of the main-line circuit, causing one-sixtieth of a revolution of the escape-wheel. Thus a minute-hand placed on the same shaft with escape-wheel *A*, will move once a minute and revolve once an hour. The standard of battery power for these dials has been fixed at 30 Leclanché prism cells for 50 dials, the resistance of the latter being 6 ohms each.

SPECIAL DEVICES AND APPARATUS.

One of the most prolific sources of interruptions in the regular working of automatic electric apparatus is in the "contacts" or points where the circuit is opened and closed. When a current is withdrawn from a wire con-

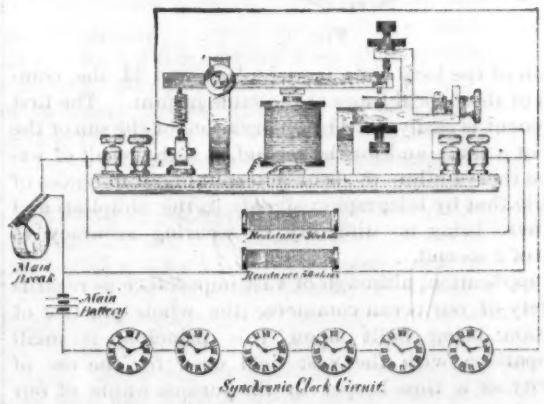


FIG. 5.

taining several electro-magnets, by the separation of the contact points, the de-magnetization of the cores of the magnets produces the same effect that would be produced by the sudden withdrawing of a permanent magnet from within a coil of wire, or conversely, the slipping of the coil of wire from off a permanent magnet. There will be a magneto-electric current generated within the wire having a quantity depending upon the strength of the original current which magnetized the cores, the size and quality

of the cores, the size and number of convolutions in the wire of the magnet coils and the resistance of the line-wire. It so happens that when much work is to be done the conditions named above are necessarily favorable for the production of a considerable quantity of the induced current. This current discharges through the air at the contact points, forms an electric arc which soon destroys their original surface and vitiates the exact adjustment and proper approximation of the points. Another difficulty is that this spark, though of considerable resistance, itself conducts a current, consequently the main-line circuit is not broken abruptly, as it should be, but gradually, as the points separate and the spark becomes attenuated. Various devices have been suggested and adopted to obviate this difficulty, and a successful arrangement of this nature is well understood by experts to be a *sine qua non* in the successful working of an electric time system.

The company has secured patents which fully obviate this difficulty, as shown in Fig. 5 in the system. This apparatus is applied to all contacts, wherever used. The diagram shows its application to a main line, but the principle is applied to local circuits also. The electro-magnet of the arrester has a total resistance of 6 ohms, and the shunt of 30 ohms resistance placed around its coils is intended to furnish a path of discharge for the magneto-electric current induced within the spools of the electro-magnet. The main line is supposed to contain, say 10 dial magnets of 6 ohms each, and the main-line shunt contains a resistance of 50 ohms. The operation of the arrester is as follows:

When the main break-point in the regulator-clock which works this circuit is closed, a current will be sent to line through the arrester magnets which will operate the dials, and at the same time cause the arrester armature-lever to be attracted. When the latter comes down, it first touches a spring on the right-hand post, which furnishes a second path for the current, through the main line shunt of 50 ohms. The result of this operation will be that when the impulse is first sent the dial-magnets receive the full strength of the battery current, and attract their armatures to within a short distance from their magnets, when the main-line current becomes suddenly lessened by the diversion of a portion of the battery current through the 50 ohm shunt. The armatures are now, however, in a denser portion of the magnetic field than when they began to move, and there will be sufficient magnetism to attract them to the magnets and to hold them there. When the main break-points are separated and the current withdrawn, the first effect is to liberate the armature of the spark arrester, since the main-line circuit is closed through the main-line shunt in such a manner that the main-break alone cannot now open it. When the arrester armature is withdrawn from its magnet, the flat spring on the right-hand post follows the armature lever in its upward movement as far as it is adjusted to stop, and then the circuit is broken between the armature-lever and the spring, and the former completes its excursion to its upper back-contact stop alone. At the moment the armature lever leaves the flat spring the magneto-electric current is discharged at this point, leaving the main break points clear, and consequently free from oxidation. It will also be seen that the small spark arising from the breaking of a circuit including a battery alone is included within scope of the connections in this arrangement. Fig. 6 shows a graphic sketch of the arrangement and will perhaps enable our readers to seize the principle in a glance.

The company also uses a special form of connection for joining ends of wires within doors, so that any number of any sized wires may be joined together in a manner perfectly sure to form a perfect connection, and secure against any subsequent loosening from jarring or any other accidental causes. The strength of the connection against rupture of the contact is only limited by the strength of the wire to resist breakage from stretching or bending. As before described, the company has established horary centres whose districts include one city block or one large building. It follows, therefore, that all the wires leading to the dials will be inside the buildings. However, to insure the greatest possible safety from accidental interruptions, the company has adopted No. 12 copper linen-covered wire as a standard, and has copyrighted a special covering of alternately red and white bands, each about an inch long, for the latter. It is expected that the unusual strength of the conductor and the peculiar color of the covering will be sufficient to protect the wires from everything but malicious interruptions. Notice cards, calling the attention of occupants and workmen in buildings to the nature of the service and the route of the wires, are posted at frequent intervals, to warn persons who might accidentally cause interruptions. For out-door wires, connecting the horary centres and other specially synchronized regulators with the prime regulator in the company's central office, heavy iron wires insulated with the "*K. K.*" covering are used. The routes of these wires are carefully selected and protected with proper guard wires. The main break of the prime clock of a district only operates one relay magnet by one Leclanché cell, the dial circuit being worked by the contact points of the relay. Chances of defective contacts at its break-points are much lessened by this arrangement. No interruption of the synchronizing circuit can affect the prime clock of a district. A tell-tale vibrating bell calls the attention of the attendant in the central office when a synchronizing circuit is interrupted; and a bell which can be switched in and out of the circuit at will warns the batteryman between what two successive minute contacts he must make any changes that are necessary in the daily service. Before a clock-dial is put in a subscriber's office the apparatus is very carefully tested in the electrician's office—its resistance is measured and recorded, and a test is made showing with how much additional resistance in circuit it will work properly on the current furnished by the standard Leclanché cell. A proper margin of safety in practical working on weakened currents is thus secured. The moving parts in the dials are never oiled, experience having shown that the use of oil is fatal to the successful working of electric clocks.

The company has patented a portable testing apparatus for the use of the inspectors, consisting of a standard Leclanché cell, a circuit-closing key and a rheostat. In order to test the actual working power on any one circuit, the in-

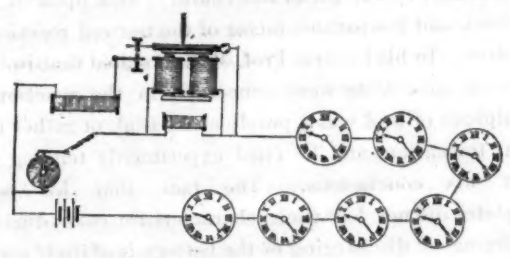

FIG. 6.

spector selects one clock-dial and connects the two terminals of his testing apparatus with the key open, one to each of the screw-posts of the dial. He then unplugs a large amount of resistance and closes his key, so that the greater portion of the current is diverted through the clock. By gradually decreasing the resistance in the shunt a point is reached where the clock will not work at all, and it is the difference between this resistance and the standard shunt with which the clock should work that determines the margin of safety. If this margin has fallen the battery strength is increased, the defects in the dial mechanism remedied, or any other cause which might produce this result removed. If in testing the dial the inspector shall have stopped it and thus thrown it out of unison with the regulator, he sets it right by his key and one Leclanché cell, by sending impulses between the regulator impulses. If he has made it too fast he detains it by diverting the main-line circuit for the necessary length of time, through a shunt of low resistance. The whole of the system has been thoroughly worked out in its details, and the combination of a high degree of inventive skill with practical experience in the application of the principles used reflects great credit on the executive management of the company, which has shown its ability to grasp the subject and to secure an able staff of experts competent to carry out the general plan.

The system is now in practical operation in several blocks in this city, and its benefits are greatly appreciated by the subscribers. The company is indebted to its electrician, Mr. Henry L. Bailey, for several special devices calculated to secure certainty and efficiency in the operation of its system.

## Meeting of the Underground Committee.

A meeting of the General Committee on Underground Electrical Communication was held at Room 47, No. 115 Broadway, on Monday, the 7th instant. The committee subdivided itself into three sections or sub-committees, according to the suggestion originally made by Col. Hazard at the first meeting, April 20. The object of this division is to facilitate the more thorough consideration of the different portions of the subject. There are three distinct sets of questions to be answered, namely, the scientific, the legal and the business, and these can be better studied by a special committee for each. Specific instructions were given by the General Committee to each sub-committee, defining its powers, prerogatives and duties. We append a list of the members composing each sub-committee, with the text of the instructions given to it:

SUB-COMMITTEE ON ELECTRICAL AND MECHANICAL DEVICES.—Albert B. Chandler, Joseph P. Davis, Frederick H. May, Henry Morton, Henry W. Pope, Garret S. Mott, Elihu Thomson, J. Eliot Smith.

Instructed as follows: It shall be the duty of the Committee on Electrical and Mechanical Devices to examine inventions now in use, or that may be presented to it, to give notice to inventors as to the nature and extent of the requirements, and state the problem to be solved, with the purpose of concentrating inventive effort in a practical direction, and generally to consider and report, for the instruction of the General Committee, the state of the art, and that the difficulties are, or are not, surmounted, or in the judgment of the committee surmountable, and in default of an ideal and perfected system to make such recommendations to the General Committee as may in its estimation seem worthy of adoption, as a partial or temporary remedy through the difficulties encountered. Pending the invention and perfecting of a completely satisfactory system, to report in the first instance to the Committee on Business.

SUB-COMMITTEE ON LAW AND FRANCHISES.—Leonard E. Curtis, Sherburne B. Eaton, William M. Ivins.

Instructed as follows: It shall be the duty of the Committee on Laws and Franchises to examine the laws and franchises granted by the State and city and the general legislation, favorable and unfavorable, bearing upon the subject; to determine whether any further powers are required, and, if so, what, in order to carry out the plan of underground electric communication in the interest of all the electrical corporations, as approved by the Committee on Electrical and Mechanical Devices, and whether or not any general law on the subject is desirable; and further, in the event that the Committee on Inventions adopt any system, invention or device which is the subject of a patent of the United States, to examine or cause to be examined the validity of the same, and its scope and sufficiency. To report in the first instance to the Committee on Business.

SUB-COMMITTEE ON BUSINESS ORGANIZATION.—Augustus C. Richards, Clark B. Hotchkiss, Charles R. Flint, Rowland R. Hazard, Thomas J. Montgomery.

Instructed as follows: It shall be the duty of the Committee on Business Organization, if it shall appear from the conclusions of the two other committees that a system is devised, or can be formed out of existing material, and that the required laws and franchises exist, to frame for the consideration of the General Committee a plan of organization for carrying into effect the recommendations of the other committees, which shall include the formation of an independent company for that purpose, if that is deemed the better way, with the necessary by-laws for the same, and a system of control in the interest of the contributing corporations, it being understood that upon the completion of the work of the Committee on Business Organization the General Committee shall be called together to act upon the reports of the three committees.

## Remarkable, if True.

We see by the German periodicals that an electrical accumulator of a very novel character has just been invented by Herr Prinz, of Vienna, who is known chiefly for his discovery of a method of making artificial turquoises. The inventor gave his first demonstration of his latest discovery lately, and the experiments were attended with complete success. He first of all charged a substance weighing about four kilogrammes, the composition of which he does not disclose, with electricity from a battery of six chrome elements, the operation of charging taking fifteen minutes. Then disconnecting the battery, he inserted in the electrically-charged substance a Swan incandescent lamp. This instantly gave a beautiful bright light, while with the chrome elements in their original condition only a mild red light was obtained. The lamp began to burn at thirteen minutes to eight P. M., and it continued to give out a steady light until two A. M. next morning. According to Herr Prinz, the material he employs for the accumulator can be manufactured at a very trifling cost. Among those present at the demonstration was Privy-Councillor Herr Brunner von Wattenwyl, President of the International Electrical Exhibition to be held at Vienna in the summer, and an eminent authority on electrical science. In his view this discovery of Herr Prinz does not give to science a new accumulator, although it shows that by the aid of an electric current a new primary current may be set up, from which a light of long duration can be obtained. Herr Prinz asserts that the apparatus will last for three years. Equally successful experiments were then made with the incandescent light, which burned steadily and with equal strength for several hours. Herr Prinz maintains, however, that the light may be made to burn for an entire day. It is also reported that further experiments with the Prinz accumulator, used in connection with an incandescent lamp, showed that the light will burn with uniform strength for a period of twenty hours. After this period it weakens down to about single candle strength, in which condition it burns for about another twenty-four hours. Experiments will next be made in order to discover how many times the composition can be used.

## The Los Angeles Electric Light Masts.

The people of Los Angeles, California, are highly gratified with the successful lighting of their city by Brush lamps on masts. A leading gentleman of the city recently sent a photograph of one of the masts to a friend in the East and wrote as follows regarding it: "This mast is 155 feet high, with Brush arc lamps of 3,000 candle power each. The city is at present lighted with seven masts of this description. One other mast has been ordered. The city has an area of thirty-six square miles. The masts vary in distance from each other from one-half to two miles. The city has been lighted with gas for sixteen years, although the area being in the most thickly built portion of the city was small, and considered very inefficient. The present cost of illuminating the city is but a trifle more than that of the inefficient lighting by gas. All portions of the city now receive sufficient light for ordinary purposes *on the darkest nights*, and in the central portion of the city where gas was formerly used, the light is far more effective than gas ever was. The public are almost unanimous in its praise. Its efficiency in wet and stormy nights, especially when the sea fog drives in, is really wonderful. In a fog, when it is so dense that the lamps cannot be seen, the whole fog is suffused with the electric rays, rendering the streets perfectly light. It is now considered the finest lighted city on the Pacific Coast. With a view to more generally distributing the light several more masts are about to be added."

THE

# ELECTRICAL WORLD,

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W. J. JOHNSTON, Editor and Publisher.

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## NEW ADVERTISEMENTS.

In the growth of our paper in circulation, size and general improvement, the value of its columns for reaching those engaged in electrical pursuits or interested in electrical matters has not failed to be appreciated by advertisers. In order to better enable our readers to notice anything new which advertisers may have to offer them, we now give in this column a list of new advertisements as they appear in each number. The following will be found in to-day's issue:

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## STORAGE CONTROVERSIES.

It may be said, and most aptly, that "the storage battery was born in sensation, and brought up in controversy." The sensational aurora which presaged its industrial birth, when the notorious M. Philippart came upon the horizon of the electrical world with his million foot-pounds of energy in "the small square box" invoiced to Sir William Thomson, has long since lost its spell on our minds. Even other subsequent storage sensations, like the electric tramway, the electric tricycle and the lighting of railroad cars, no longer exert the fascinating interest of novelty. In a word, we have ceased to look upon the storage battery as an event; we have begun to consider its value as a fact, and here is where the era of controversy is inaugurated, for while some whose opinions are authoritative look at it as a valuable addition to the *materia electrica* of electrical engineering, others no less eminent are disposed to disparage its value in this respect. So much has been said within the last year, both for and against the storage battery, that it is a matter of considerable difficulty to decide between the negative and the affirmative. Listening to the arguments of one side, we incline to the belief that he is in the right; and when we came to compare the two we are literally non-plussed. We have had a striking instance of this kind lately. Prof. Henry Morton, in his recent lecture on the subject before the New York Electrical Society, made out a good case in all respects for the storage battery, and certainly the good results which he has obtained from it in the installation at his own residence are a very strong indorsement of the favorable opinion which he has of it. On the other hand, Prof. G. F. Barker, in speaking of the efficiency of storage batteries before the National Academy of Sciences, gave us but little to recommend it. He did not deny that its success was possible, but he would have us understand that it belonged to the future rather than the present. He places its efficiency as low as fifteen per cent., and that is good ground for *his* opinion in the matter.

But this is not the only point on which others must decide "when professors disagree" about the storage battery. There is another controversy now coming up in regard to the theory of its action which is really more important, as it bears more directly on the former one. The opinion is divided among scientists as to the nature of the actions which take place during the operations of charging and discharging storage batteries. The part which the gases resulting from electrolysis of the solution play, the function of the sulphate of lead which appears on the plates, are among the questions which are subjects of contention. Many scientists consider the presence of sulphate of lead objectionable and detrimental to the efficiency of the battery. Others, notably Messrs. Gladstone and Tribe, in England, and Prof. Keith in this country, look upon it as a necessary and inseparable factor of the normal reactions themselves. In his lecture, Prof. Morton stated that in his opinion the gases alone were concerned in the reactions; that sulphate of lead was a purely accidental, or rather incidental formation, and he cited experiments tending to support his conclusions. The fact that his peroxide plates did not lose their characteristic color during the charging or discharging of the battery is of itself good evidence in favor of his theory. Now, one naturally feels bound to inquire, in such cases, whether the conditions differ from those under which other experiments have worked, and in fact there is one noticeable difference. Prof. Morton recommends the use of more acid in the solution. Instead of 10 per cent. he uses 20 per cent. of acid in his solution; and just here we remember that the experiments of Messrs. Gladstone and Tribe show that with solutions more strongly acid the tendency to the formation of lead sulphate is lessened. Perhaps here may be the real secret of the whole controversy, in a mere question of the strength of solution, so that in one case at least, the more theoretical question becomes the more practical of the two.

If it should appear upon further investigation in the line of this suggestion that the failure of the storage battery in certain cases has been due to such causes, we would have an additional instance of the fact that "circumstances alter cases," in electricity especially.

While on the subject of storage controversy, we must make note of still others of a somewhat graver nature. We refer to the litigation with which it has been identified. This alone would justify the aphorism with which we began this article. It shows another thing, moreover, that the storage battery is worth talking about and fighting about. The litigation which attempted to obstruct the progress of the Sellon-Volckmar battery in England a year ago and the interference suits which have been brought to contest the Faure patent in this country are good evidence that considerable value is attached to the storage battery by electricians. The latest phase of this kind of controversy is found in a difficulty between the Light and Force Company and the Electric Accumulator Company, both of this city. This trouble is very much to be regretted. It uncovers certain little doings which occurred during the "sensational epoch" and which can only serve to bring the subject of storage itself into disrepute. The matter is intricate in the extreme, but, so far as we can determine, the American patents of the Faure accumulator, or part of them at least, have been sold to two distinct concerns, each of which presumes itself to be the *bona fide* owner. Whether the cause lies in a sin of omission or one of commission, and who are the parties to blame, are questions which it appears even the learned judges find hard to decide. In any event, these controversies are to be regretted. They do not tend, as those of a scientific order, to bring about increased knowledge or further progress. Their tendency is simply to confirm the bad opinions of the enemies of the storage batteries; and to corroborate the assertion of Edison, for one, who says the storage battery brings out a "latent capacity for lying."

It is acknowledged that much remains to be done in this field. Why not, then, go to work in search of a better battery, instead of stopping to question or quibble over what is now before us? We believe in the storage battery and in its future. We believe even in its present, and would like to see its friends lend their efforts to impel it onward to its sphere of activity and usefulness, legitimately and without ruse or artifice of any kind.

## Telpherage.

It is a most promising sign when such men as Prof. Fleeming Jenkin, of world-wide fame and reputation for accurate and deep knowledge, come to the front and make a suggestion bearing on the practical application of principles with which they are so well acquainted. We have always reasoned that, all things considered, he is most competent to suggest a remedy who knows the most about the disease and about remedies in general. Now, Prof. Fleeming Jenkin is not only a profound and skilled electrician, as his excellent treatise on "Electricity and Magnetism" goes to prove; but he is, furthermore, thoroughly versed in the principles of engineering, as the excellence of his teaching in the chair of civil engineering at the University of Edinburgh demonstrates. Prof. Jenkin has been studying that all-absorbing problem, the electric railway, to which we referred in our last issue as the problem of the day. He anticipates trouble from the leakage, which is an inevitable result in ground lines; and, on the other hand, he wishes to avoid the extra expense and the greater or less inconvenience of having to take the current from side or overhead lines, as lately done by Sir Charles Siemens. He proposes a new expedient for electric propulsion which, though it may not prove applicable to all cases, will no doubt be found useful in several places. The idea of Prof. Jenkin is to transport vehicles or cars containing goods or passengers from one point to another, independent of any control exercised by the vehicles themselves, by means of a system of strained cables, hence the name "telpherage." According to a brief description of the system in a recent number of *Engineering*, Prof. Jenkin proposes to employ strained metal cables, which will serve both to sustain the load and to convey the electric current. The frames or trucks supporting the load run along the cables on wheels, and the cars or loads are suspended below them from the axles of the wheels.

An idea of the arrangement may be formed by comparing it to a railway track formed of cables from which the train hangs as if turned upside down. The overhead railway which is to be seen in machine shops, where heavy machinery is transported from one spot to another, is also a good illustration of Prof. Jenkin's idea. The cables are divided in equal sections supported on posts, the arrangement being suggestive of the elevated railroad like that in the City of New York. In the simplest arrangement of the line there is a break of continuity at each post supporting it, and the sections of cable are themselves insulated from each other and the earth. They are, however, capable of being connected by movable coupling pieces, actuated by the train, so that all the sections receive the exciting current and form part of the general circuit. The current is supplied to the line by a stationary dynamo-electric machine driven by a steam engine or other motor.

The loads or cars on the telpherage line are connected together in trains, and the length of a train is nearly the length of a section of the cable or conductor. On passing either of the movable coupling pieces between two sections the train throws it out of action, disconnecting the two sections at that point, but the circuit between these sections is maintained through the wheels of the train itself and a conductor on the train. In circuit with this conductor is a dynamo-electric motor, which is actuated by the current and propels the train by driving the wheels. The power provided is more than sufficient to keep up a maximum speed, and the train is provided with a governor which, when the speed is sufficient, closes a shunt and allows the current to pass without traversing the coils of the electric-motor. The governor acts directly to check the train if the speed becomes excessive, by short circuiting the electric-motor, or otherwise bringing electric brakes into operation. To further insure that one train shall not overtake another, Professor Jenkin provides an automatic telegraphic communication along the line, and the trains, in passing, close and open the telegraphic circuits. This automatic telegraph actuates circuit closers between the different sections of the main cable or conductor, so as to maintain connection between the sections for a certain distance behind the train, quite independently, it may be, of the movable coupling pieces. It is obvious that a following train entering upon a part of the line in which the sections are thus connected will have its speed checked, as the application of the power upon the train depends upon there being a break in the electrical coupling between the two sections on which the train is for the moment supported. It will be seen from the above description that the control of the trains is completely automatic and independent of the train officials.

It will be seen quite readily by the practical electrician that this disposition provides at once for good insulation. Indeed, the insulation may be made as good as in a telegraph line, and under ordinary circumstances the same dynamo may be made to supply a much longer section of the "road," without undue or excessive leakage. With ground lines of electric railway, like that of Siemens or Edison, the leakage is very marked, and for this reason Mr. Edison has adopted the plan of dividing the whole line into short sections of a few miles, with stations and feeding dynamos at each. Dr. Werner Siemens favors the use of an insulated conductor supported beside the line, and giving current to the motor on the train by means of a running connection pulled by the train. There is one dis-

advantage attaching to this procedure, however. The contact is not always as sure and as sufficient as it should be, for we must bear in mind that the conductors will oxidize in the open air. In Prof. Jenkin's system the whole weight of the car helps to insure the contact just as when the current is transmitted through the rails. Professors Ayrton and Perry have sought to overcome the leakage difficulty by making the line in very short sections, each of which is put in circuit with the dynamo in turn as the train progresses, by an automatic action of the train itself. In this way there is only one section electrified at a time —namely, that over which the train is running—and the leakage on the whole line is consequently very small.

It does not seem to us that this new system would be very expensive. Indeed, we believe it would prove cheaper than the present method, as the necessity of a special line to carry the current in the improved system of Sir Charles Siemens is of itself an item of considerable expense, while it strikes us that the occasion for repairs and overhauling will be likely to be rather more frequent than would be desirable in an every-day practical system. The idea advanced by Prof. Jenkin is new, and certainly deserves the consideration of electrical engineers. We should be glad to hear of its experimental adoption on a line of a mile or more, to see how it would compare practically with the ordinary electric railway system.

## OUR ELECTRICAL AGENCY.

We thank many readers of THE ELECTRICAL WORLD for their interest in the Electrical Agency recently established by us. It may interest them to know that the agency has got fairly under way, and already has applications for patents pending in behalf of clients who first heard of the agency in THE ELECTRICAL WORLD of April 28. This instantaneous success goes to show the need that existed for just such facilities as we now offer to the electrical public. The following letter from the Western Union manager in an important Southern city is one of several of a similar nature which we have received :

SIR—I think you are entitled to the thanks of the electricians of this country for your new departure in the publication of a strictly scientific paper; and I trust you will meet with abundant success. I am also glad to see that you have turned your attention to the patent business. I know the difficulties which beset the inventor of electrical devices on account of the ignorance of the science of electricity on the part of the average patent lawyer. I have about ready now an application for a patent in this line, and would be glad to know your terms, which I trust you have had the forethought to make reasonable.

We did have the forethought to make our charges for services very reasonable. The aim of the agency is to do thorough, intelligent, painstaking work, and to make the rates as low as are at all consistent with first-class work.

## Electrical Exhibition in Italy.

We have just received some official documents from the executive committee of the Italian General Exposition, which is to be held in Turin from April to October, 1884. It appears from these that there will be a section specially reserved for the applications of electricity, and that foreigners are invited to exhibit under the same rules and provisions as govern native exhibitors. In the prospectus issued by the sub-committee on mechanical apparatus of precision and applied to the sciences, an invitation is addressed to the electrical world generally in terms so pressing that they deserve to be quoted :

"In addressing itself to the electricians of all countries to invite them to send specimens of their products and to come to the meeting of all the Italian producers, in the centre of one of the most industrial provinces of the nation, to demonstrate the importance of the great industrial applications of the electric current, the committee is certain that its invitation will be taken into the serious consideration which it deserves. If there is a country where industry can cherish great hopes on the applications of electricity, that country is Italy, which, being now compelled to import from abroad all the coal for steam-boilers and for gas lighting, sees for the future in the water-falls and in the torrents of its Alpine valleys an inexhaustible source of motive power.

"The Italian manufacturers feel the need of taking into account the great applications to which electricity can give rise, and they will not fail to make use of them. To the interest which called electricians in 1881 to Paris, in the winter of the same year to London, in 1882 to Munich, and to the interest which will recall them again to Vienna in 1883, will be added to invite them to the Turin Exhibition, the consideration founded on the extensive field of applications which this exhibition will open for them in a country now rising to large manufactures."

According to the official bulletin accompanying the prospectus the exhibits will be divided into thirteen distinct classes :

1. Statical electricity : frictional and induction electrical machines, electrophoroi, condensers, electro-meters, etc.

2. Electro-chemistry: materials for electrical apparatus and electrical circuits, batteries and their accessories, accumulators, porous cups, insulators, etc., telegraph wires, cables and other conductors for the electrical current lightning rods.

3. Apparatus for the study of the electric current:

(*a*) Instruments for electric measures: rheometric magnetic needles, galvanometers, electro-dynamometers, standards of capacity, standards of resistance, boxes of resistance, rheostats, electrometers, etc.

(*b*) Apparatus for the study of the properties of currents and for relative didactic demonstrations: thermo-electrical batteries, apparatus for electro-dynamics and for electro-magnetism: apparatus for the study of induced currents, induction-bobbins, etc.

4. Application to the transmission of signals and analogous applications. Indicators at a distance: chronographs, electric meters, electric registering apparatus, electric clocks.

5. Telegraphs, telephones, microphones.

6. Applications to the biological sciences.

7. Application to the safety on railways : signals, block-systems, etc.

8. Applications to the firing of mines, and analogous applications.

9. Industrial production of electric currents ; magneto-electric machines and dynamo-electric machines.

10. Electric lighting.

11. Transport to a distance and distribution of mechanical energy by means of electricity, electric railways, electric plowing, etc.

12. Electro-metallurgy and galvanoplastics.

13. Various applications.

All applications for space must be sent in before the 31st of August, 1883, and must be made out on special blanks, which will be furnished on application to T. Villa, president of the executive committee, Turin, Italy. Reduced freight rates will be secured for the benefit of the exhibitors. The regulations issued by the executive committee state that the committee reserves itself the right to refuse the acceptance of articles which by insufficient indications on the schedule of application could be found inadmissible only from the actual inspection of them. Motive power will be supplied gratuitously for the lighting and for the experiments which must be made in the galleries and in the gardens by determination of the committee itself ; in this case the installation or placing of conductors also will be provided for, gratuitously. In any other case the motive power will be given at a price varying from 30 centimes to fifty centimes an hour and per horse-power, according to the number of hours of work and according to the amount of power required ; and the exhibitors will be enabled to make their experiments in such halls and in such places or premises as the executive committee shall have placed at their disposal.

The committee reserves to itself the right to regulate the distribu- tion of power according to circumstances and according to requests.

Italy appears to be a good field for the electrical industries. In electric lighting it has proven a rich source of profit to the French companies, especially the *Société Générale d'Electricité*, which was the first to work its way into that country. The Edison light has been introduced in Milan within a year, and there is no reason why other American systems might not also find something to do there, where the various French companies have monopolized the field during the last half-dozen years. It strikes us that where so much power is daily going to waste, the electric railway also would find the great economic factor which does not exist in most other places where the experiment has been tried so far.

It is not impossible that this exhibition may interfere to a serious extent with that which is to be held in Philadelphia under the auspices of the Franklin Institute, in the summer and fall of 1884, from the fact that it is nearer the countries which are expected to contribute to an exhibition of this nature. We should deplore any circumstances that would tend to detract from the success of an American electrical exhibition; all the more so from the fact that America has chosen to lag behind in the matter of electrical exhibitions, whereas it ought to have been first in such a matter.

## To Subscribers.

Present subscribers who prefer *The Operator* to THE ELECTRICAL WORLD have only to notify us to have their subscriptions transferred. *The Operator* will be sent for *twice* the length of time the subscription to THE ELECTRICAL WORLD is paid for. To those who do not notify us we shall continue to send THE ELECTRICAL WORLD. As, however, we offer to send *The Operator* from the present time until the end of the present year for 50 cents, as a kind of trial trip, we hope all readers of THE ELECTRICAL WORLD will remit this small amount and take both papers during that period.

Many have already done so. Those who have not yet remitted the fifty cents will oblige by doing so now, that their names may be entered for both papers. This will prevent their missing any of the issues. There is not a reader of THE ELECTRICAL WORLD who will not be benefited to the extent of several times fifty cents by reading *The Operator* until the end of the year. Those who disagree with us in this opinion are requested to test the matter practically by remitting the fifty cents and trying *The Operator* until the end of the year.

## The New York Electrical Society.

The lecture on "Electro-metallurgy," which was announced for the meeting on the 4th inst., was postponed on account of the unavoidable absence of the lecturer, Prof. N. S. Keith, who was called out of town on urgent business at the last moment. In the absence of the regular speaker an informal discussion on underground conductors was opened by Mr. Hamblet, of the Western Union time service, who related some interesting facts that had come under his observation in years past. Mr. F. W. Cushing added a few remarks on the Fuller conduit now being laid in Chicago. President Small narrated some experiments made to determine the amount of retardation taking place in a section of aerial cable half a mile long. Prof. P. H. Vander Weyde then described a system of underground telegraphy, devised by himself, which is designed to be free from disturbances by induction or retardation. The system is extremely ingenious and effective, and its most interesting feature is in the fact that in a cable composed of several conductors the current transmitted on any one line returns by dividing equally through all the other lines in the cable, instead of returning through the ground. No ground connections are necessary, and, therefore, the disturbances due to earth currents are eliminated entirely.

Prof. Vander Weyde added some very interesting remarks bearing on the subject of the lecture of Prof. Keith. Prof. Vander Weyde is one of the pioneers who, with Jacobi, Spencer and others, developed the art of electro-deposition, and he had with him the specimens which resulted from his earliest attempts in this field. Other specimens showing the later progress in the art were also passed around. The professor then gave a brief analysis of the reactions which take place in the electrolytical deposition of the metals. Altogether the meeting was most interesting, in spite of the disappointment caused by the absence of Prof. Keith. The president announced the reception of a valuable present in the shape of a condenser, presented the society by Mr. Wm. Marshall, instrument manufacturer. The condenser is graduated in eighths, fourths, halves and ones, and has a total capacity of 14⅞ microfarads. It is said to be absolutely correct, and is estimated to have cost over $100. A vote of thanks was tendered Mr. Marshall, and it was decided to place an appropriate inscription on the condenser.

The society appears to be in a prosperous condition, and in a fair way to assume a higher importance in the electrical community. It is a pity, however, that so many of the members fail to attend the meetings regularly. There is material enough, and of the best quality, in the city to make the society equal to any of its kind in Europe, if only a little more attention were given it by many who could contribute to its growth, but do not seem to do so. Why cannot the brighter lights of our science in the city condescend now and then to shine, that the radiance of their knowledge may diffuse a glow of advancement over us all ?

## To Non-Subscribers.

To non-subscribers who may see THE ELECTRICAL WORLD we would say that we are engaged in what we consider a very laudable effort to furnish a strictly first-class American weekly electrical journal. The present and the last two or three issues speak for themselves. Electricians, we are glad to say, are not slow to appreciate our efforts. Those, however, who have not yet subscribed for the paper are asked to send us their subscriptions, both to show their interest in a high class American electrical journal, and also that they may keep up with the latest progress and development in electrical science. The special offer we make to mail the ELECTRICAL WORLD, from the present time until the end of the year for $1.00 or both THE ELECTRICAL WORLD and *The Operator*, for $1.50, ought to induce every one connected with the electrical business in any of its branches to read both papers, at least until the end of the year.

## Correction in our Supplement.

A mistake occurs in the table of data about pure copper wire which was issued as a supplement to THE ELECTRICAL WORLD of April 28. The decimal point is misplaced in the square millimetres column of the area portion. It should be one figure further to the right. Thus, 10.4435 should be 104.435. We copied these data from an advance proof kindly furnished us by Messrs. W. T. Glover & Co., and in the limited time at our command did not undertake to question their accuracy by going over the computations.

## Telephone Matters in England.

*To the Editor of The Electrical World:*

SIR: Notwithstanding all that has been said and written in the United States about wires being placed underground in cities in England, the fact remains that the telephone wires are a grand exception in this respect, for they run in all directions over the housetops, in a manner similar to those in our American cities. About the first thing I noticed on arriving in London (that is to say, when the fog had lifted sufficiently to enable me to notice anything) was the peculiar method of running housetop wires and the construction of fixtures. They are very much neater than our cumbersome and unsightly structures, and perhaps the reason why the companies are not hunted down with underground legislation to such an afflicting extent as in America is that the esthetic sense of the public is better satisfied with their appearance. To give your readers a chance to judge for themselves, I send you two sketches. Fig. 1 gives the general appearance of these fixtures with the insulators and wires attached. Fig. 2 gives a larger view of the insulator, and shows its construction as well as the manner of securing the wires to it. This type of insulator is known as the shackle insulator.

Referring to Fig. 1, it will be observed that this mode of construction brings the wires *one above another*, instead of *side by side*, as in our method. The wires are drawn up so that the sag of each one is the same as that of all the others, and, although they are very close together, they seem to keep their position without coming in contact with each other. The pole or shaft consists generally of iron tubing,

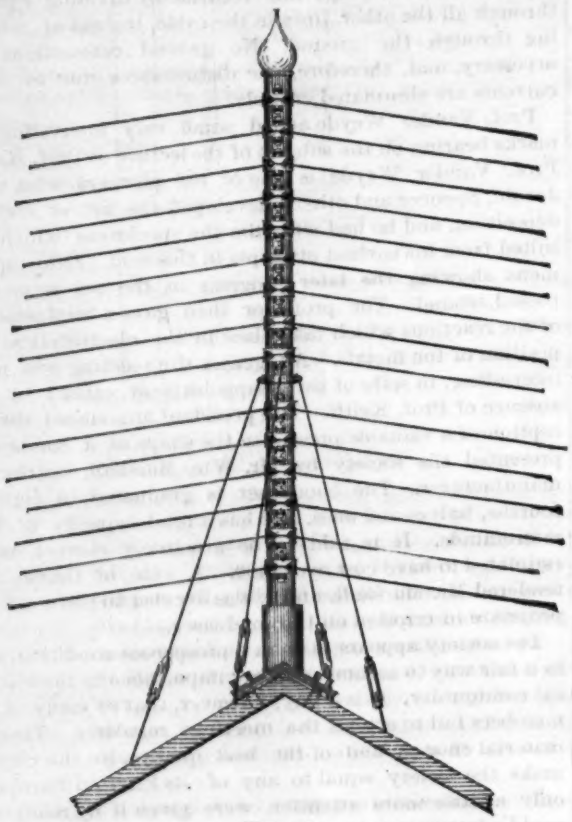

FIG. 1.

though sometimes it is made of solid iron; this is securely stayed, as in Fig. 1, on from three or four sides, and where the height of the pole requires it two sets of stays are used, one set attached near the top and another about the middle. I noticed that several of the stays are supplied with an adjusting link, as shown in the sketch, for the purpose of taking up the slack when occasion requires it. The shackle insulator (Fig. 2) seems somewhat complicated for the number of parts used in its construction. *A* is the tubular iron post, *B* the bracket, *C* the porcelain or earthenware insulator, *D* the iron bolt which passes through its centre and is fastened to the iron straps *E E*. The opposite ends of these straps are secured to the bolt *F*, which passes down through the hole in the bracket *B*. The whole is firmly secured to the pole by an iron strap or clamp *G*, the ends of which are fastened to the bracket by bolts. By this arrangement the insulators can be placed to accommodate wires approaching from any point of the compass.

To avoid confusion, I have made the drawing so as to show the insulators on one side of the pole only, but in many cases I have seen them standing in all directions around the pole, carrying as many as eighty wires. Usually, however, they are more uniform and appear as in the drawing. In many cases they use two insulators for one wire. Just why this is does not appear, unless it is a suggestion from the insulator manufacturers.

The objections to lines of this description may not be very serious, but one or two suggest themselves. For instance, the liability of leakage of the current from insulators of this construction in wet weather (and there is a preponderance of wet weather here) on long lines where the galvanic current is used for signaling. This is what is universally used for that purpose, and they employ the Leclanché battery. They have not got our fine magneto calls yet, and it may be some time before they adopt them.

Another objection to this style of line construction, which might be a more serious one if used in America, is that in case one or more of the top wires should break, as in a sleet storm, for instance, the chances would be of crossing up the others, and perhaps breaking them down one after the other, like a row of ten pins.

Some hints may, however, be learned from this method of line construction which may or may not be useful to new companies starting in the United States.

I had the privilege of visiting one of the central offices in London. I was surprised to find them so far behind us in improvements in telephone apparatus. They showed me their central office switch, which was the identical one

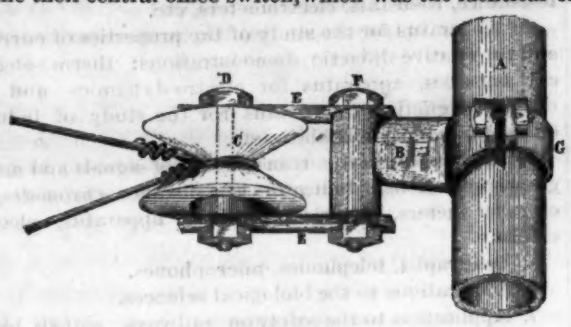


FIG. 2.

Mr. Bell brought over some five or six years ago. I inquired whether they had not seen the improved styles of compact plug switch-boards now so common in the United States. They said yes, and that they had one somewhere. After looking around, a very small one about six inches square was pulled out from under a shelf. I asked why they did not use that style, it being so much more compact and easier to handle. They said they "were thinking about it." I found this was not the only case where our English friends were extremely slow in adopting improvements. The office seemed to work smoothly, however, but *time* does not seem to be of as much account in making connections as we consider it in the United States. The girl at the switch-board got her long terminal cords tangled up and had to stop and unravel them, while I could imagine the subscribers *patiently* waiting to be connected. I inquired what position the gentleman that so kindly showed us all the *new* things held in the company, and was informed that he was the fault superintendent. This accounted to my mind for his worn, sad look. To those who are not familiar with the duties of a fault superintendent it may be said that he is the unfortunate individual who receives complaints as they come in, and attends to repairing the various troubles to which telephone lines are subject. This gentleman is subjected to vials of wrath and profanity from indignant subscribers whose lines *never* work "just when they want to use them the most." It is a position similar to one held by a gentleman in the Metropolitan Telegraph & Telephone Company, New York, and, by the way, I believe even *he* does not enjoy good health.

LONDON, March 30, 1883. A. A. K.

## Electrical Railway Company Incorporated.

At Albany, N. Y., on Monday last, May 8, papers were filed incorporating the Electrical Railway Company of the United States. The incorporators were, Messrs. Grosvenor, A. P. Lowrey, Sherburne B. Eaton, Robert M. Gallaway, Thomas A. Edison, Simeon G. Reed, Robert E. Deyo, Stephen D. Field, Charles W. Rogers, John P. Kennedy, and George S. Scott. These gentlemen, with the exception of Mr. Edison, are to be the directors for the first year. At a meeting of the directors of the new company, held at No. 120 Broadway, this city, on May 9, the following were elected officers for the coming year:

Simeon G. Reed, president, Charles W. Rogers, vice-president; Charles Dimon, secretary and treasurer; Stephen D. Field, electrician.

In conversation with a representative of THE ELECTRICAL WORLD regarding the aims and objects of the company, Mr. Stephen D. Field, one of the patentees, said:

"Our system is based on a combination of patents owned by Mr. Edison and myself. My calculation dates prior to 1877. The caveat bears date 1879, with a reduction to practice during the summer of 1881. Mr. Edison's patent permitted him to use the same in the summer of 1880. The objects of the company are the acquisition, development, use and disposition of devices, inventions, improvements, caveats, applications for patents, patents, grants, concessions or privileges for electrical propulsion, or the use of electrical apparatus on railways, or applicable in any way to the use of electricity or electrical apparatus in any form for constructing, equipping, operating or maintaining railways, or for railway appliances. The capital stock of the company is fixed at $2,000,000, divided into 20,000 shares of $100 each. The company is to carry on business in both the United States and Canada. It possesses and controls all the apparatus formerly owned by Mr. Edison and myself, including Mr. Edison's electric railway at Menlo Park, three miles in length, which has been running since last summer, and also a little electric railway constructed by me. We shall proceed to make a series of demonstrations, or rather experiments, on the Menlo Park railway. The business of the company will be conducted under the superintendence of myself."

Mr. Field added that the company would be ready for business some time during the coming fall. There was no probability of the enterprise falling through. The use of electricity for railway purposes was not an experiment, but had been practically demonstrated, especially in Europe, where there are one or two electrical railways now in operation. The experiments at Menlo Park were to be made simply to test the different forms of electrical apparatus in the hands of the company, in order to ascertain which is the best for practical use.

"Will your patents," asked the reporter, "conflict with European patents?"

"No," was the reply. "Our patents will not be affected whatever by European patents. We ante-date those. The only difficulty that has been experienced in this country toward making electricity available for railway purposes has been the contest among the patentees and inventors—chiefly Mr. Edison and myself—as to priority of invention."

As stated in last issue of THE ELECTRICAL WORLD, Mr. Field has been devoting much attention to the problem of applying electricity to street railroads. It is understood that Mr. Edison will be the consulting electrician for the new company, but neither a director nor an officer.

The first practical work to be undertaken by the new company will, it is said, be to place an electric engine in operation on the elevated railway. The arrangements to do this have already been begun, and before long the public will have an opportunity to see how it works. The company promises to relieve the city of the smoke, the noise, the flying ashes, the water leaking, and other nuisances that have attended the use of steam on the elevated roads. The plan is to use the rails as conductors. The locomotive will be a moving dynamo. The electricity will be picked up from the tracks.

## Menlo Park.

It is an hour's ride from Jersey City to Menlo Park—the brakemen and other haste-making people of the rail call it "Mellow Park," with that marvelous talent for mispronunciation which distinguishes them everywhere. Gliding out of the whir and roar of the city you pass into a smooth country dotted with pretty stations and reflected by a broad canal, clear and smooth as a mirror. At the Park a hill confronts you. A board walk of the time-honored village order of architecture leads to the top, from where one can look southward and see miles of beautiful lowland bordered by the purple rim of a hazy horizon. There are foggy mornings in that valley sometimes, and evenings of such soft splendor that to look down upon them from the heights of Menlo Park is to enjoy a bit of topographical beauty of an uncommon kind.

This is the highest point of land between New York and Philadelphia. It rises directly northward from the little railroad station and spreads away into level ground again on the hill-top, over which big, roomy houses are scattered, conspicuous among them are Mr. Edison's work shops, those famous walls within which the "Wizard of Menlo Park" wrought the marvels which have made him famous. How quiet and half-asleep the place looks, with its big white houses and the electrician's workshops from which issue no beat of hammers nor whir of wheels. A stranger who did not know that this is "scientific ground" would never dream that that long wooden building which looks like a scuffed school-house had been the cynosure of the inventive world. Men are plowing in the fields, giving a pastoral atmosphere to the picture. A range of hazy hills lie in the extreme southeast, and just out of sight to the eastward is New York. Knowing that it is there one can almost feel the throb of its mighty heart. Its electric lights can be seen any night.

The commissioner of THE ELECTRICAL WORLD was one of a party taken to visit Menlo Park by Col. W. G. Sherman, electrical engineer, representing the Edison system in Buenos Ayres. Among his guests were Señor Jorge Hammeker y Mexia, member of the Mexican Congress and editor of *La Libertad*, city of Mexico, and Señor Enrique Rodriguez Miramon, civil engineer, or *ingeniero civil*, as they say in Spanish, from the city of Mexico. These gentlemen had read much of the genius of Menlo Park, and were delighted to visit the scene of his experiments. There was considerable talk about "currents," "conductors," "dynamos," and other terms which left the unscientific members of the party floundering in hopeless ignorance. The glibness with which people of an electric turn rattle off the names of the machinery they use and the terms which explain its operations is something that excites the wonder of those untaught in their specialty. Then, too, there was much mangled English, and Spanish so twisted from its original sound as to be unrecognizable to a native. The Mexican *ingeniero civil* was just groping with the intricacies and perplexities of our mother tongue, and interspersed his comments on the marvels of electricity with vain longings for a universal language. Mr. Edison, who spends most of his time in his rooms in the city, expected to accompany the party, but was called away early that morning. He sent a telegram to his superintendent, Mr. Charles T. Hughes, authorizing him to show the electric lions, of which the railroad is now not only the greatest, but almost the only one that graces the Park. The workshops have been dismantled, most of the experimenting paraphernalia having been removed to Mr. Edison's rooms in the city. Many men are still employed there, but not in experimenting. They operate the commercial department, their work being largely a matter of figures, and not inventive effort.

The big workshop contains little besides a long table, around which the workmen tinker in an absorbed way, and over which curious little weights are pulled by

strings, the uses of which only their manipulators know. There are barrels of resistance spools. Several boys were fastening them to fine wires, and around the walls of the room they hang by the hundred. A glance into an adjoining room reveals numerous glass jars filled with the potent blue liquid which generates the subtle force. Mr. Clark, Mr. Upton and other members of the wizard's colony drop in and talk on the possibilities of electricity and the inventions of the future.

The electric railroad was the goal of the excursion. To be carried over that was the dream whose realization was what Mrs. Carlyle facetiously calls "a good joy." A board walk of the most primitive pattern, literally no pattern at all, in fact, leads out to it. Seven thick coils of wire, covered with asphalt, run in a shallow ditch by its side. These "condooktors" the *ingeniero civil* prods with his cane and wonders "why seven?"

The railroad has the slenderest of iron rails and delicate little ties, all exactly alike. It is narrow and looks like a strip of bordered tape stretched over the green carpet of the spring. The engine is so little that it seems presumptuous in it to assert itself fit to carry any kind of a train. The coach attached is like a diminutive horse-car. Altogether, it seems like playing at traveling, which, indeed, it is. Away goes the enchanted train, without steam, heat, cinders or smoke, not so rapidly as the lightning, but quite fast enough for travelers to see the country. Too fast for the safety of the hat of the Spaniard who is coping with the English tongue. It is wafted into a field of plowed ground, and he goes on in smiling serenity, delighted with everything, electric railroads most of all. On the return trip he finds it hung on a stick so close to the track that he could reach it from the platform, an incident which caused him to declare, in strong though not grammatical diction, that this iss surely a courteous country, even if its language is the most difficult in the world. The road runs over trestle-work, curves around trees with low, hanging branches, and around fences and tangled, damp-looking clumps of undergrowth. It is two and a half miles long, and the trip is made one way in six minutes, which is said to be slow time. Owing to the late rains and the general settling down of the ground—which is the duty of all ground in the spring—the road is rough, and the highest speed not attainable. After the ride, the uninitiated touch the engine wheel and shriek their surprise at the shock. They touch the track just passed over, and by putting one hand in the water of the little ditch at its side and the other on the wires which run along the side of the bar, discover that the mysterious agent is powerful there.

The room containing the dynamo machines is visited, and also the beautiful engine which supplies the power for all departments. It is as bright as a new coin, and the little room is as dainty as a parlor. On the wall hangs a picture of Mr. Edison. The face is a young one, and singularly gentle in expression. On this being remarked upon, one of the members of his staff said: "Yes, and he is as good as he looks. I have known him four years, and I never saw him angry; never heard a coarse or unkind word from his lips. He is really a most perfect man. No one can be associated with him and not love him."

"Do many visitors come here?" somebody asked.

"Not now; and when they do they only stay an hour or two and go back on the next train."

The lamp factory is located in Newark and employs nearly two hundred women.

## Electric Cranks.

THE FANCIED INVENTORS WHO HAUNT THE OFFICES OF A TELEGRAPH COMPANY.

A prominent electrician of one of the telegraph companies, says the Chicago *Tribune*, speaking recently said:

"We are overrun with inventors and deluged with plans for cables and underground systems. About every other man who calls to see us has a box under his arm containing a model of his scheme. We are glad, indeed anxious, to listen to them. While we do not expect anything perfect, or nearly so, we live in the hope that they may bring around an original idea which we can elaborate. We are willing to spend money in experimenting, and to afford them the use of our wires—in short, put our facilities for investigation at their command. This is generally known, and apparently acts as a powerful stimulus to the imagination of a host of—of—"

"What?" he was asked.

"I was about to say cranks. Very few of these 'inventors' are connected with telegraphy or any other form of applied electricity. It is singular also that a large percentage of them belong to one profession—the practice of a certain department of pathology—which has not the remotest relationship to electricity. They do not appear to realize that electricity is really a most abstruse science, and they rush in where its great professors fear to tread."

Asked to describe some of the inventive cranks and their ideas, the gentleman continued: "O, they are innumerable. The other day a jovial old farmer-looking chap came into my office to see, he said, the managing electrician. I referred him to the superintendent, but he wanted a 'practical man.' Then he informed me that he had discovered a system of underground cables which was perfect. I asked him how he had found it, and he replied that it had been revealed to him in a dream. In his vision he had completed a machine by which he could cover with an absolutely perfect insulating material 400 miles of wire a day? He had not yet received his patent, and knew nothing of telegraphy, but would sell his invention for $1,000,000, and would explain it after we had paid over the money. Another man in Indianapolis wrote that he had discovered a cable so indestructible that the earth might be consumed and his cable would remain intact. He also wanted us to purchase his secret first.

"A man came to us," the gentleman went on, "with the plan of a new battery, one cell of which should equal three Callaud's—the most constant battery known. It was a very new idea—that is, when his grandfather was born—the old salt-battery. The inventor claimed that its strength would never decrease. We made the experiment at considerable expense, thinking he might have something new. We found his claim as to the continuousness of his battery correct. It was so continuously weak we couldn't measure its power on the finest galvanometer. These fellows generally hit on old ideas. One of them—an Illinois school teacher—built a set of instruments that cost him his savings for a year and a half, only to find that he had taken up an induction idea long ago abandoned. Another man has a scheme for working a common iron wire under water, which he can't explain, but which he says is all right. Another came to me with a multiplex instrument, and also to learn how to wind the bobbin in it—the first thing an instrument-maker learns.

"The plans I listen to daily for electric lights, telephones, instruments and cables are too many to enumerate. As a rule they are impracticable from the beginning. It is useless to tell these people to learn the first principles of the great force they aim to subvert. The knowledge that telegraph companies keep up a keen hunt for improvements and liberally encourage investigators urges them on. The prize to success is great. The man who invents a perfect cable or a new multiplex system will gain the key to a fortune like those of the modern Monte Cristos.

"However, instances are on record of amateurs stumbling upon great ideas. The germ of the duplex system, which is of incalculable value, was born in the mind of an operator who made no pretensions to proficiency in the science of applied electricity. The existence of aerial currents of electricity which may be used without wires was claimed as a discovery by two different men, each an amateur. The electric light was first made practicable by a man who was not a professional, and the inventor of the telephone was a college professor."

## Transmitting Time by Telephone.

We have been aware that time can be *saved* by means of the telephone, but it appears that we had overlooked another interesting relation between time and the telephone, namely that time also can be *transmitted* by it. A system

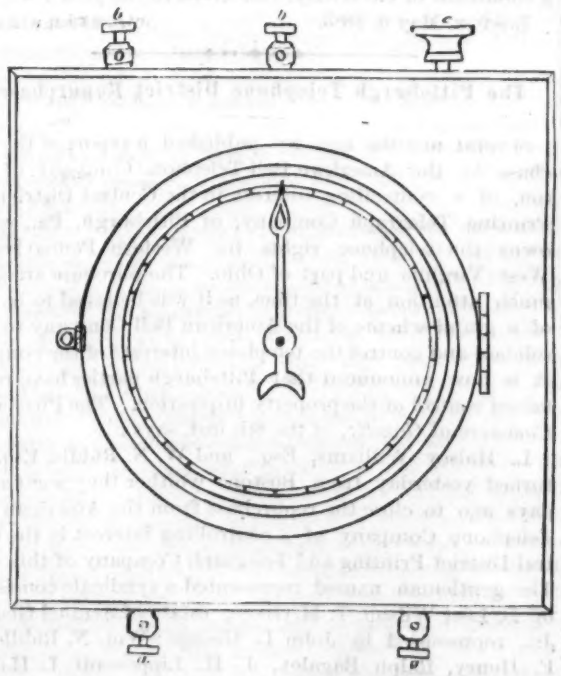

FIG. 1.

for transmitting time from a central standard clock, lately invented by Mr. C. W. Ruehle, of Detroit, Mich., has been in successful use in Ann Arbor, in that State, for the last six months, in transmitting the time of the observatory clock to jewelers and business men in various parts of the city.

After reading the elaborate account of the Time Telegraph Company's system of transmitting time by telegraph, in the present issue, no doubt our readers will be interested in a brief description of Mr. Ruehle's system, by Mr. M. W. Harrington, which appeared in a recent issue of *Science*:

Its general character can be seen from the accompanying figures. Fig. 1 is the face view of the transmitter. At *a*, *a* are the binding-posts for the wires from the battery; *b*, *b*, those for the wires of the telephonic circuit. Between the latter is a switch, not represented in the drawing, which enables the operator to cut out the telephone circuit when any thing goes wrong; *c* is a button, by pressing which the instrument can be set going. When started, it runs for two and one-half minutes, during which time the hand in the centre completes a revolution. At the end of that time it stops, and can be started again only by pressing the button.

In Fig. 2 we have a view of the interior. We have here ordinary clock-work, with the addition of a Ruhmkorff coil at *d*, the unlocking part *e*, a circuit-breaker at *f*, and an intermitting wheel *g*. This wheel moves to the right. As it turns, the radiating bars on it are brought to a vertical position one after the other; and, while passing this position, they raise the lever suspended above, and, by the action of a pin at its end, keep the circuit open. They are so placed and gauged that they hold the circuit open from 55 to 60 seconds of the first, and then of the second minute.

Each break in the primary circuit causes a distinctly audible sound in the ear telephone. This sound is so loud that I have sometimes heard it across the room. As the circuit is broken each second for the first fifty-five seconds of each full minute, and for the full thirty of the last half-minute, the time transmitter gives a series of seconds signals easily received at any telephone in connection with it. The intermission of five seconds at the end of each full minute serves to notify the receiver that the next minute is about to begin and thus saves him the trouble of counting.

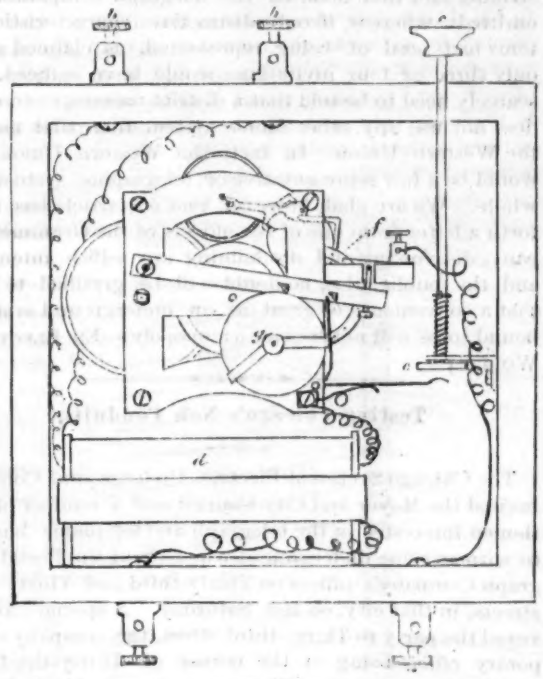

FIG. 2.

In using the time transmitter the person who desires the time calls me up by telephone and I start the transmitter at the beginning of some minute by his time. The correspondents are usually jewelers and do not need to be told the minute at which the transmitter began. If they do need the minute it can be given them verbally by the Blake transmitter. The succession of beats and intermissions gives the receiver four opportunities for comparison, viz., the beginning of the first, second and third minute and the end of two minutes and a half.

An important feature of this method is its capacity for transmitting time to several or many persons simultaneously. In order to test this, Manager Keech, of this place, obligingly called up all the exchanges connected with us. Some did not respond, but those who did—a dozen or fifteen in number and distant in all directions from ten to seventy-five miles from us—all heard the beats of the transmitter distinctly, except at Port Huron. From this and some other tests I concluded that by this method the time could be received by at least twenty-five telephones simultaneously.

## The Gramme Company and the Underground Question.

*To the Editor of The Electrical World:*

SIR: In your issue of April 28, in an article headed "The Underground Problem," you say that there are electric light companies, "doing a lucrative business," not represented in the General Committee on Underground Communication. The simple fact is that the committee is a direct result of a similar committee of the Gramme Association, which includes all the "systems" to be provided for. That there are other companies using some or all of these systems is not material, but only that all systems shall be included. It is the province of the General Committee to look after general interests, including patent law, legislation and the exposure of fraudulent devices to rob the public under the guise of electric companies, and it took this matter up in due course as a subject of vital and general interest. Ultimately it invited the co-operation of companies using other and different systems, and no system or interest is omitted. The Brush Company uses the arc and incandescent system in connection with the storage battery. The Edison Company adopts the incandescent system with direct current and

permanent bar ways. The Fuller and Houston-Thomson systems use the arc lamp exclusively. The Jablochkoff Company employs alternating currents and parallel candles, and the United States Company uses a combination of the arc and incandescent systems, with direct current from the dynamo. There is no other system in use.

The Gramme Company has really done most of its work at the cost of these companies, but in this case, as heretofore, it has acted not only in its own interest, but for the benefit of all bona-fide companies and the public at large. Its work is now transferred to the general committee.

ROBT. W. BLACKWELL, Secretary.

NEW YORK, May 9, 1883.

[This has reference to our leading editorial of April 28, in which we commented on the fact that only those electric lighting companies belonging to the Gramme Company were invited to be present at the meeting of the Underground Committee, April 20. In doing so we simply expressed an opinion that is held by many others. It is a striking fact that none of the telegraph companies were omitted; whereas, if only distinctive, characteristic systems had need of being represented, as claimed above, only three or four invitations would have sufficed. We scarcely need to be told that a district messenger company does not use any other Morse system than that used by the Western Union. In fact, the Western Union itself would be a fair representative of telegraphic systems as a whole. We are glad, however, that our article has called forth a letter from one of the officers of the Gramme Company, disavowing and disclaiming any selfish intentions; and the public, also, no doubt will be gratified to know that a convenience so great as an underground system is bound to be will not become a monopoly.—ED. ELECTRICAL WORLD.]

## Testing Chicago's New Conduits.

The Chicago Sectional Electric Underground Company invited the Mayor and City Council and a number of gentlemen interested in the telegraph and telephone business to witness some underground-wire tests at the Postal Telegraph Company's offices on Thirty-third and Thirty-ninth streets, in that city, on last Saturday. A special car conveyed the party to Thirty-third street, the company's temporary office being at the corner of Thirty-third and Arnold streets. Among those present were Mr. J. E. Fuller, manager of the company; Mr. G. W. Felton, Western Union; Mr. Fay, Chicago Telephone Company; Mr. Knapp, Board of Trade Telegraph Company; Mr. Fairbanks, New York, and Mr. Swarthout, both of the Postal Telegraph Company; Mr. Gray, Mr. Edward Koch, Mr. Barrett, ex-Chief McGarigle, Col. Peters, and several members of the City Council. The conduit had been laid between Thirty-ninth and Thirty-third streets, but owing to the heavy rains of Friday the work of completing the connection had been much delayed and was not quite finished when the party arrived.

After some delay the instruments were erected, the wires attached, and the first message via a mile of buried wire flashed along the line to New York. It was plainly demonstrated that the wires worked satisfactorily through the conduit, so far as telegraphing was concerned. Mr. Gray tried to communicate by telephone, but with very little success. He said he could hear what Mr. Cushing, at the New York end said, but he could not make Mr. Cushing understand what he said. It was intended to have some experiments or exhibitions in duplex-telegraphy and printing by telegraph, but owing to the delay and the fact that the arrangements were imperfect these were postponed. The conduit, which is of iron, contains two chain-work shelves made from copper-wire. As many as fifty wires may rest on each shelf, and below the shelf is a space for the large cables. The wires are strongly insulated, and may be packed together without any deterioration in service from induction. The system costs about $6,000 per mile, and the company states that it will be much cheaper in the city than the ordinary overground wires. It is intended to put down an extra large size for the centre of the city, so that any number of lines may be accommodated.

## Another School of Electrical Engineering.

The establishment of departments for the study of electrical engineering in some of the technical schools like the Stevens Institute has led other institutions to consider the feasibility of doing likewise. Among these the old Norwich University, of Norwich Vt., latterly known as Lewis College, of Northfield, Vt., is now spoken of in this connection. The school was originally a kind of military institution, having been, in fact, founded by a soldier Captain Alden Partridge, at the time superintendent of West Point military academy. It was incorporated in 1834. During the war the school did not prosper, although its name was glorified by the heroic conduct of many undergraduates upon the battle-field. Since 1866 the University had been removed to Northfield, Vt., and had been known as Lewis College. Many of its graduates are residents of New York, and are taking active measures to have their "*alma mater*" placed again upon a sound financial basis. Gen. G. M. Dodge, of this city, is at the head of a committee of those interested in the old school. It is proposed to remove the institution to Brattleboro, Vt., and to restore its old name of Norwich University, and to combine it with an electrical engineering school, if the citizens of Brattleboro will only subscribe a sum sufficient to cover the expense of making the change and of providing the better facilities desired. It is thought that a sum of $25,000 would suffice for this purpose.

Many of our prominent electricians entertain the project of founding an electrical school there with more favor than they did the movement which was instigated some time ago for the purpose of establishing a similar institution in New York City, principally on account of the greater expense of maintaining such a school in the city, and on account of the higher cost of living to the students. It is said that Mr. Edison and some of the officers of the Western Union Telegraph Company favor the Brattleboro scheme.

## Spiral Telephone Wire.

The descriptive notice of the new spiral telephone wire which appeared in the ELECTRICAL WORLD of the 28th ult., has called forth a letter from Mr. R. M. Hunter, civil engineer, of Philadelphia, who informs us that two or three years ago he conceived the application of spirally twisted wire to telephone circuits, and that if the company now manufacturing the spiral wire could not show a prior claim he would take measures to assert his rights to the invention. We are also in receipt of a letter from Mr. Gorham Gray, the patentee of the wire manufactured and sold by the American Spiral Telephone Wire Company, who informs us that the idea is not a recent one with him. As it is possible that others may also have been working in the same channel, we reproduce this letter for their benefit:

*To the Editor of The Electrical World:*

SIR: My conception of the idea originated some sixteen years ago, when I adopted the spiral lightning rod for my country houses, then building; but as such rods were then twisted, thereby losing strength and making the *cost* of the wire far too great for *telegraph* uses, I laid it aside until I could conceive the practical method of spiraling the wire, *i. e., grooving it spirally, cheaply and without twisting.* Telephony next called my attention to the matter again, and I at once set about getting up a simple contrivance for spiraling wire both for making *nail-driving screws* and for such uses for telegraph, telephone and electric lighting purposes as should prove of value. These machines carry the die around the wire automatically in proportion to the number of turns desired in a given length; and the broad patent granted me for this method of spirally grooving wire without twisting seems to cover the only practical method of manufacturing a spiral wire for obviating or avoiding induction, twisting a wire for this purpose being entirely impracticable, both in use and in cost. The many months of use of this wire for telephone purposes seem to warrant my original conception of the advantages to be obtained by using a spiraled wire as a conductor of electricity, conceived in the year 1867.

BOSTON, May 5, 1883. GORHAM GRAY.

## The Pittsburgh Telephone District Repurchased.

Several months ago we published a report of the purchase by the American Bell Telephone Company, of Boston, of a controlling interest in the Central District and Printing Telegraph Company, of Pittsburgh, Pa., which owns the telephone rights for Western Pennsylvania, West Virginia and part of Ohio. The purchase attracted much attention at the time, as it was believed to be part of a grand scheme of the American Bell Company to consolidate and control the telephone interests of the country. It is now announced that Pittsburgh parties have re-obtained control of the property in question. The Pittsburgh *Commercial Gazette*, of the 8th inst, says:

L. Halsey Williams, Esq., and W. N. Riddle, Esq., returned yesterday from Boston, whither they went a few days ago to close the repurchase from the American Bell Telephone Company of a controlling interest in the Central District Printing and Telegraph Company of this city. The gentleman named represented a syndicate consisting of D. Leet Wilson, T. H. Given, estate of Samuel George, Jr., represented by John L. George; Wm. N, Riddle, D. F. Henry, Ralph Bagaley, J. H. Lippencott, L. Halsey Williams and George I. Whitney, being the parties who three months ago sold to the Boston corporation named above the controlling interest in the Pittsburgh company, and they now repurchase $360,000 of the $500,000 of capital stock. On the original deal the members of the syndicate made a profit of between $71,000 and $72,000 each, a portion of which they have now re-invested. The object of the Boston company in paying such a large price for the Pittsburgh district rights was to obtain a direct system of communication between Boston and Chicago. Pittsburgh was an important intermediate point, and without the rights in this district communication could not be had. New contracts were entered into on Saturday, under which a number of very valuable additional concessions and privileges were given to the company, and it is one of the best investments in the county. In its district there are now in use over 2,500 telephones, and the receipts of the company are very large, the dividends being liberal.

## Fired by Lightning.

One of the most destructive oil fires that has ever occurred in this vicinity took place on Thursday morning last, May 10, and was caused by an oil tank belonging to the National Storage Company's works at Communipaw, Jersey City, being struck by lightning during the severe shower which occurred about half-past three o'clock that morning. When the lightning struck the tank a huge sheet of flame immediately shot up in the air with a deafening report that shook the neighborhood and was heard for miles around. A canopy of smoke like a colossal balloon rose above the oil works and spread itself over the city like the pall of a volcano at the commencement of an eruption. Then followed explosion after explosion, rivaling the crashes of the thunder, and the extensive oil works were soon a roaring mass of flames. The shaft of lightning of unequaled brilliancy and vividness that struck the first tank was seen by a fireman a mile away, and an engine at once started for the scene. It was soon discovered to be a useless work to play upon the flames, and all efforts were directed to prevent them from spreading. After tank No. 7 exploded it was found that six of the men who had been near it were missing.

About the same hour a building at Nos. 413 and 415 East Twenty-Fifth street, occupied by Bradley, Currier & Co., window, sash and blind manufacturers, was fired by a stroke of lightning and destroyed.

## The Chicago Farce.

A Chicago dispatch of the 8th says: "After an uproarious meeting of the City Council, lasting till after 1 A. M., and which at times threatened to degenerate into a free fight, the ordinance giving the District Telegraph Company the exclusive right hereafter to erect overhead wires was carried by a majority vote. This ordinance—which Mayor Harrison, who is charged with being in the job, declared beforehand he would sign—effectually kills underground telegraphy in this city, and moreover gives the District Telegraph Company an extraordinary monopoly, inasmuch as all telegraph companies desiring to construct wires must apply to it, instead of to Council."

This "District Telegraph Company," as elsewhere shown in to-day's issue, is a new concern, possessing nothing in the world except the valuable privilege thus bestowed upon it by the Council, which would be sufficient capital in itself if there were any likelihood of the Council's action being sustained. It is, however, too gross an outrage upon equity, public policy and common decency to admit of the thought, and there should be no difficulty at all in overthrowing it in the courts. The outlook is that the Chicago agitation is drawing to its close, and that it will end as it was conceived, in folly.

## Draw Attention to The Electrical World.

Readers are requested to draw the attention of their friends in the business to the efforts THE ELECTRICAL WORLD is making to furnish American electricians with an original, able and comprehensive weekly review of electrical progress and development. Many would be glad to subscribe for such a paper were they aware of its existence. Kindly speak of THE ELECTRICAL WORLD to them and see if you cannot get us their subscriptions until the end of the year, at the special rate of $1.00.

# THE TELEPHONE.

MICHIGAN.—Telephonic communication was established between Battle Creek and Kalamazoo on the 1st inst.

PENNSYLVANIA.—The telephone line between York, Columbia, Lancaster and Harrisburg was opened for business on the 2d inst.

NEBRASKA.—A telephone cable across the Missouri, connecting Omaha and Council Bluffs, has been completed and will be opened for business at once.

IOWA.—There is talk of connecting Indianola with Knoxville by by telephone. If the connection is made it will also be extended to Oskaloosa, and thence to Keokuk.

ONE CAUSE.—It has been discovered that one cause of the popularity of the telephone consists of the fact that by means of it a man can talk with a friend five minutes without asking him to take a drink.

WINONA, MINN.—Mr. Ben. Huck, agent for the Louisville Telephone Company, has been overlooking the ground in Winona with a view of establishing a telephone line from there to Carrollton and Greenwood.

A BORN TELEPHONIST.—A boy baby was recently born in Montana with ears as large as a palm leaf fan. Telephone managers are already trying to secure him to take charge of a central office.—*Commercial Advertiser.*

MASSACHUSETTS.—The new police telephone system in Salem is being tested by the telephone company preparatory to its adoption. The Suburban Telephone Company has been granted the necessary permits to lay a direct wire from Waltham to Watertown.

AN OPERATOR PROMOTED.—Mr. W. J. Gilmour, formerly chief operator of the telephone exchange at Montreal, has been appointed manager there. It is believed that the popularity of the telephone in his city is largely due to Mr. Gilmour's conscientious work in that department.

MARYLAND.—Dr. C. F. Russell superintendent of the telephone on the Chesapeake & Ohio Canal, is now on a tour of the entire line of that work, superintending and

giving instruction in the working of the telephone, which has proved an important adjunct in the successful working of the canal.

WHY IT IS POPULAR.—The telephone is very popular in Colorado. By means of the telephone an absent-minded stranger, while talking to a native, can feel in his hip-pocket for a handkerchief or piece of tobacco without being shot. It is thought that very soon all conversation in Colorado will be carried on exclusively by telephone.—*Philadelphia News.*

PIONEER TELEPHONE COMPANY.—At the annual meeting of this company the following officers were elected: President, Wm. E. Livingston; treasurer and clerk, Edward F. Coburn; directors, Wm. E. Livingston, E. T. Rowell, H. B. Shattuck, J. W. Bennett, Chas. J. Glidden. A dividend of 10 per cent. was declared. The company now own two wires between Lowell and Boston.

NEW COMPANY.—Articles incorporating the Molecular District Telegraph and Telephone Company were filed last week with the county clerk. The cash capital is $700,000, divided into 28,000 shares. The incorporators are Braddock E. Strong, 5 shares; Joseph L. Hance, 10 shares; Jacob T. Van Wyke, 5 shares; Cortlandt P. Dixon, Jr., 13,990 shares, and John I. Waterbury, 13,990 shares. The lines are to run from this city via Albany to Boston, Long Island, Staten Island, through New Jersey and to Philadelphia.

ILLINOIS.—The wire to connect Mount Pulaski with Decatur is now being put up. Telephone connection between Rockford and Dixon (Ill.) was completed on the 5th, giving communication between Rockford, Byron, Mount Morris, Leaf River, Polo and Oregon. The tariff between any of these places is 25 cents for a five minutes conversation. The line between Rockford and Garden Prairie will be finished by next week, and as soon as the Elgin end is completed Rockford will be able to talk with Chicago.

ANOTHER TOUGH TELEPHONE YARN.—A Western paper has the following: A few nights ago the editors at work on the top floor of the tallest newspaper office in New York heard the fire engines gathering at its base about midnight. Stepping to the telephone one of the editors called to the police headquarters a mile away: "Is our office on fire?" "No," came the prompt reply. "It is a little building around the corner." It took less time to ask the question of a man a mile off, who knew all about it from routine reports, than to go down stairs and see for themselves.

TELEPHONE CARTS.—There is no limit to the enterprises the telephone has suggested. One of the latest is telephone carts, two of which have been built in this city for Messrs. Diehl & Lord, of Nashville, Tenn., brewers, who propose during the warm evenings to supply their customers, on telephone call, with pony kegs of lager beer fresh from their ice-houses, so that a family can enjoy a glass of beer on a sweltering evening without being compelled to send to a liquor saloon. These carts will no doubt soon be in use by grocers, bakers and all tradesmen who supply the household.

TEXAS.—It is stated that work will soon be commenced to connect Marshall, Texas, with Jefferson, in the same State, and Shreveport, La., by telephone. The intimate business relations existing between the three cities is given as the prompting motive for the enterprise.

It is reported that a proposition will be made by the telephone and telegraph company of which Logan H. Roots, of Little Rock, Ark., is president, to purchase the military lines running west from Denisons, taking in Jacksboro, Concho, Fort Davis and intermediate points, and the line bearing from Concho southeast to Mason, Fredericksburg and Boerne, terminating at San Antonio; also including the line from San Antonio to Eagle Pass, including Castroville, Brackett and Fort Clark. Several private parties will compete for the purchase of the new centre lines or part of them.

MEXICAN TELEPHONE STOCK.—The shares of this company (par value $10.00), which we last issue gave as selling at $3\frac{7}{8}$ are now quoted at $2\frac{7}{8}$. The Boston *Herald* states that "a sufficient cause for the decline is found in the report, our authority seeming to justify publication, that the company is in need of money; that no less than $50,000 will be required to properly develop the business in Mexico that the indebtedness of the company to the promoters, heretofore reported at $12,000 is now $27,000, and that the gentlemen wanted their money—in fact, that one of them, who is also an officer of the company, has been in Boston this week to see how the money was to be raised. It has not transpired what the plan is, but it does look as if the stockholders, through their representatives, the directors, would soon be brought face to face with the question of active management of their own property."

UNITED TELEPHONE COMPANY IN BUENOS AYRES.—The Pantelphone Company has united with the improved Bell Company in Buenos Ayres. The consolidated company thus formed has the advantage not only of all the rights, patent and privileges of the parent companies, but also of the extensive plant established by the Pantelephone Company, whose system of central offices, wires, pole and housetop lines unquestionably surpasses any other in South America. The quantities of latest improved telephonic supplies, including new cable and switch board appliances, 1,200 new Bell instruments, with Blake transmitters, and over 1,000 miles of the best telephone wire, which are now being received by the United Company, guarantee to the people of Buenos Ayres a telephone service essentially needed and hitherto unknown. The company is under the direction of experienced men from England and the United States, as well as Buenos Ayres. Major Alexander Wood, chairman, is known all over the South American coast as well as in London, as the managing director of the Western Brazilian (cable) Company. Mr. F. W. Jones, late general superintendent of the Telephone Company of Brazil, is managing director. He is almost as well known in Buenos Ayres as in Rio Janerio, where his telephonic work was most gratifying to the public. Two of the other directors of the company, Messrs. Edward Zimmerman and Adolph Fels, are also widely known on the River Platte.

## THE ELECTRIC LIGHT.

CROWDED OUT.—Electric Lighting XXVI. will appear in next issue.

IOWA.—The U. S. Electric Light and Power Co. is organized at Dubuque with $150,000 capital.

ARC LAMPS.—The number of arc lamps in use in the United States is estimated at somewhat over 75,000.

ILLINOIS.—The Vermilion County Electric Light and Power Company was licensed on the 3d inst.; capital stock, $25,000.

MORE LIGHT WANTED.—The County Board, at Chicago, invites proposals for lighting the new court-house by electricity. The bids are to be opened on the 14th inst.

THE MOMENTOUS QUESTION.—The people of Nashville, Tenn., are to decide by their votes whether they will pay $43,000 for electric lights for their streets or continue to rely upon gas at a greatly reduced rate.

THE PHŒNIX.—The Phœnix Electric Light Company recently gave a very successful exhibition of the Craig system in use by that company at the Grand Trunk Railway workshops at Point St. Charles, near Montreal.

A PLANT FOR NEW MEXICO.—Messrs. Fraser & Chalmers, of Chicago, are building an electric plant consisting of a 75 horse-power engine and a 100 horse-power boiler, for driving two 40-light dynamo machines, for the city of Albuquerque, New Mexico.

A PAPER BATTLE.—The Canadian Electric Light Company and the Thomas & Houston Electric Light Company have opened a newspaper war in Montreal on the merits of their respective lights, which promise to eclipse in time the famous Dakers-Ress controversy.

LIGHTING A KENTUCKY WOOLEN MILL.—The Edison Incandescent Company, New England department, is put a plant of 325 lights in the Old Kentucky Woolen Mills at Louisville. The order came to this department, as it has had the most experience in mill work.

AFRAID OF ELECTRIC LIGHT WIRES.—The City Council of Milwaukee has ordered that all electric light wires must be removed from the telegraph poles and either run in separate aerial cables or underground. The danger of casualties, particularly in case of fires, is given as the ground for this action.

NINE MILES OF ELECTRIC LIGHT.—It is proposed to light up the road from Montreal to the Back River, nine miles from the city, with the electric light. The Back River is a favorite summer resort. The road is a straight one, and the lights are to be placed every nine acres on the telegraph poles. The effect will be magnificent.

AN ELECTRIC LIGHT MAN IN BRAZIL.—The Cleveland *Leader* publishes an account of life in Brazil, given by Mr. A. H. Reece, of the Brush Electric Light Company, who is now in South America in the interest of the company. Mr. Reece tells some large stories about the buzzards, snakes, cockroaches and other peculiarities of that country.

JOURNALISTIC ILLUMINATIONS.—The newspaper offices which are now using Edison's electric light are: New York *Herald*, *Times*, *Sun*, *Commercial Advertiser*, *Mail and Express* and *Evangelist*, the Berlin (Prussia) *Boersen Courier*, the Boston *Herald* and *Advertiser*, the Philadelphia *Ledger* and *Record*, the Baltimore *Sun*, the *Ohio State Journal*, the Davenport (Ia.) *Gazette* and the Cologne (Germany) *Gazette*.

PHOTOGRAPHING BY ELECTRIC LIGHT.—An interesting experiment in photography was made at the Madison Square Theatre recently. The house was lighted by a large number of arc lamps of the Brush Electric Light Company. The stage was set with the pretty Russian cottage scene in the first act of "A Russian Honeymoon." Clear and beautiful photographs of the scene were taken in four seconds by the instantaneous process.

ELECTRIC LIGHTING AT THE RAILWAY EXPOSITION.—The electric features of the forthcoming Chicago Railway Exposition will be among the most interesting of all, and will include displays of arc and incandescent lighting by nearly all the electric light companies in the United States. Beautiful effects will be produced by the introduction of colored electric lightning in and about the great fountain in the centre of the Exposition Building, creating floods of gorgeous coloring.

THE ELECTRIC LIGHT FOR MILLS.—At a meeting of the New England Cotton Manufacturers' Association recently, it was stated by one of the speakers that since the last meeting, six months ago, there has been no improvement in quality or price of electric lighting. The position of the underwriters has generally been acceded to, and during the past year there have been no accidents on account of the use of the light. About one mill in fifteen insured in the Mutual companies is now lighted in whole or in part by electricity. With proper precautions, that is now the safest form of artificial lighting. The necessity was urged for testing frequently an electric light system, just as the pressure or steam in a boiler is watched.

NEW ENGLAND.—A proposition to a Boston electric lighting corporation from parties in Providence, R. I., who represent a large amount of money, for the establishment of a central lighting station and putting in a plant of its system have been accepted. Work on this new project will be begun at once, and it is probable that the station will start 100 lamps. Arrangements have also been completed for putting in a plant at Old Orchard Beach this summer, which will light the Old Orchard House and other large hotels as well as the beach. This will increase to a great extent the popularity of this already popular resort, and will probably lead to the more general adoption of this system of lighting at summer watering-places. The dynamo machines and engines will be placed in the basement of the Old Orchard House.

## MISCELLANEOUS NOTES.

A NEW ELECTRIC MANUFACTURING COMPANY.—The Capital City Electrical Manufacturing Company of Columbus, O., to manufacture electrical apparatus of all kinds, is to be incorporated.

AN OHIO VIEW.—The emotion about the underground telegraph system in Chicago is absolute nonsense. The condition of the streets will not permit such a system.—*Cincinnati Commercial Gazette.*

THE OPERATOR.—The May 15th issue of *The Operator* will be ready for mailing on Tuesday next, 14th. Operators are very enthusiastic over the division of the paper into two different journals, and already subscriptions are pouring in from all directions.

THE FIELD PRINTER.—The Commercial Telegram Company of this city announces that it is prepared to furnish members of the Stock Exchange and others with the new "tickers" invented by Mr. Stephen D. Field. The company has been granted by the New York Stock Exchange equal rights and privileges with those allowed to any other company furnishing stock quotations, and it says that neither pains nor expense will be spared to make its system superior to any in use.

A NEW METAL FOR ELECTRIC CONDUCTORS.—An Associated Press dispatch from Washington says: "J. Edwin Sherwin, the metallurgist of Boston, has just concluded here a series of experiments upon a new metal recently discovered by him, with the view of ascertaining its fitness as compared with other metals for telegraph wire. Experiments, it is said, show that wire made of this metal has great tenacity, does not rust, and is superior in point of conductivity to any wire used for telegraphic purposes. The metal used, which has nearly the specific gravity and somewhat the appearance of silver, can be produced, it is said, at a cost of five cents a pound." We presume that by a new metal is meant a new alloy or compound.

AN ELECTRICAL TELLER FOR CONGRESS.—Architect Clark, of the National Capitol, has given permission to Messrs. Williams & Crosby, of Boston, to erect and put in working order in one of the rooms of the Capitol their electrical arrangement, which has been designed to register and record votes of parliamentary bodies. By this system an aye and no call of the House of Representatives can be made in less than a minute. The machine prints the name of each member and indicates on what side he votes. It also indicates the absentees and those who are paired. Under the present system it takes over half an hour to do this. A roll call to show who and how many members are present, which now takes twenty-five minutes, can be done in less than half a minute. In cases where the minority may want to consume time by fillibustering the electrical system of course can be temporarily laid aside.

STOCK QUOTATIONS.—Telegraph, telephone and electric light stocks were quoted on Wednesday of last week and Wednesday of this week as follows:

| | May 2. | May 9. |
|---|---|---|
| Western Union Telegraph | 82¾ | 83⅝ |
| Mutual Union Telegraph | 20¾ | 20 |
| American Cable | 68¾ | 69¼ |
| American District Telegraph | 30 | .... |
| Edison Illuminating Co. | 50 | .... |
| Edison Electric Light Co. | 315 | 305 |
| Parker Electric Manufacturing Co. | 215 | 212 |
| N. J. & Long Island Telephone Co. | 96 | .... |
| Overland Telephone | 30 | .... |
| Underground Electric Cable | 50 | 55 |
| U. S. Electric Light | 50 | 127 |
| Shaw Telephone | 39 | .... |
| Bay State Telephone | .... | 125 |
| Brush Electric Illuminating | .... | 95 |
| American Electric Light | .... | 7 |
| Mexican Telephone | 3⅜ | 2¼ |
| Tropical Telephone | 2⅞ | 2⅝ |
| American Bell Telephone | 221 | 228¼ |
| Northern Telephone | .... | 145 |

## ELECTRICAL PATENTS ISSUED

*And Dated May* 1, 1883.

| | |
|---|---|
| Armature for Dynamo-electric machine; Leo Daft, Greenville, N. J. | 276,568 |
| Electric-arc lamp; Leo Daft, Greenville, N. J. (3 patents) | 276,565, 276,566, 276,567 |
| Electric railway; Leo Daft, Greenville, N. J. | 276,569 |
| Electric telephone; James H. Robertson, New York, N. Y. (2 patents) | 276,630 276,631 |
| Electric telephone transmitter; James H. Robertson, Brooklyn, N. Y. | 276,632 |
| Electric way; Walter H. Knight and Edward M. Bentley, Washington, D. C. | 276,829 |
| Electric heating apparatus; Albert Lieberman and William Robb, Philadelphia, Pa. | 276,840 |
| Electric way; Edward M. Bentley, Washington, D. C. | 276,953 |
| Electric call; Jacob B. Currier and David Hall Rice, Lowell, Mass. | 276,960 |
| Incandescent electric lamp; Philip Diehl, Elizabeth, N. J. | 276,571 |
| Individual telephone call; Jas. A. Lakin, Westfield, Mass. | 276,604 |
| Insulator for telegraph wires; Jos. S. Lewis, Birkenhead, County of Chester, England | 276,839 |
| Insulating electrical conductors; J. Gardner Sanderson, Scranton, Pa. | 276,891 |
| Insulating electrical conductors and a new compound suitable to be used for this and other purposes; Willoughby Smith, Wharf Road, City Road, County of Middlesex, England | 276,916 |
| Machine for covering wire for electrical purposes; John J. C. Smith, College Point, N. Y. | 276,724 |
| Process of covering wire for electrical purposes; John J. C. Smith, College Point, N. Y. | 276,725 |
| Telephonic annunciator; George L. Weaver, Boston, Mass. | 276,739 |
| Voltaic arc light; Otto A. Moses, New York, N. Y. | 276,702 |

## BUSINESS NOTICES.

Operators' paralysis is guaranteed a cure by the use of Dr. Jerome Kidder's electro-medical batteries. Send for catalogue to the Jerome Kidder Mfg. Co., 820 Broadway, N. Y. City.

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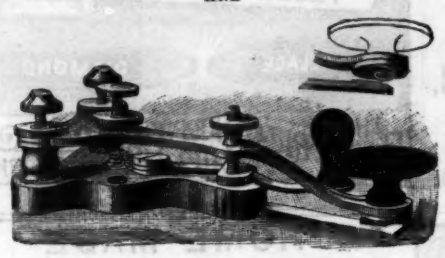

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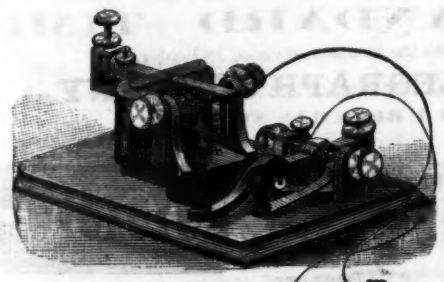

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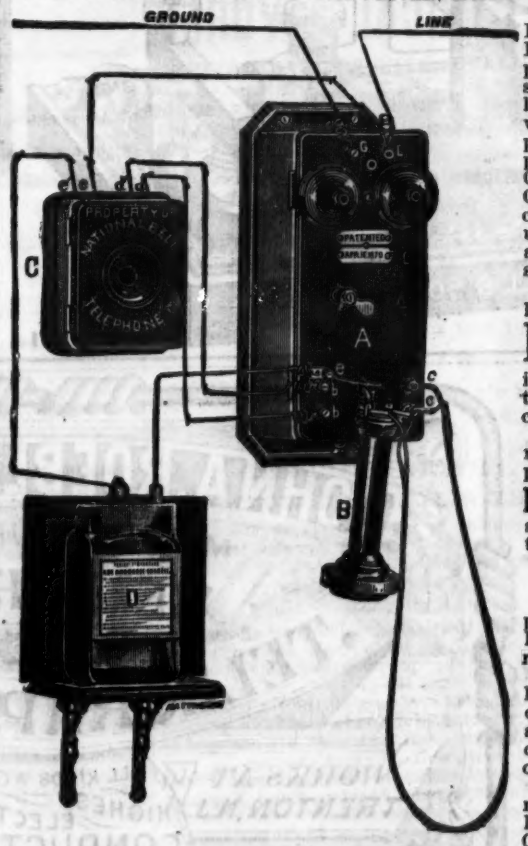


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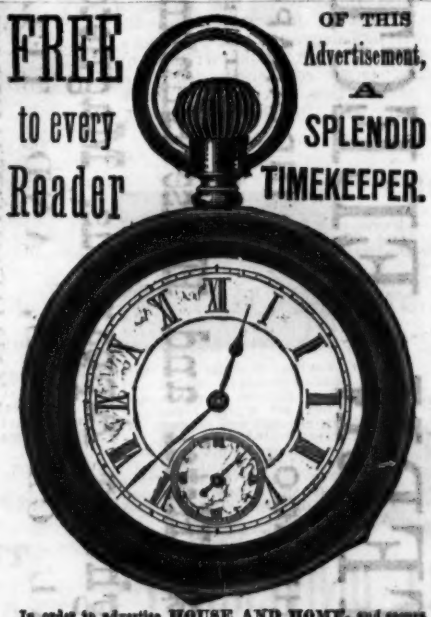

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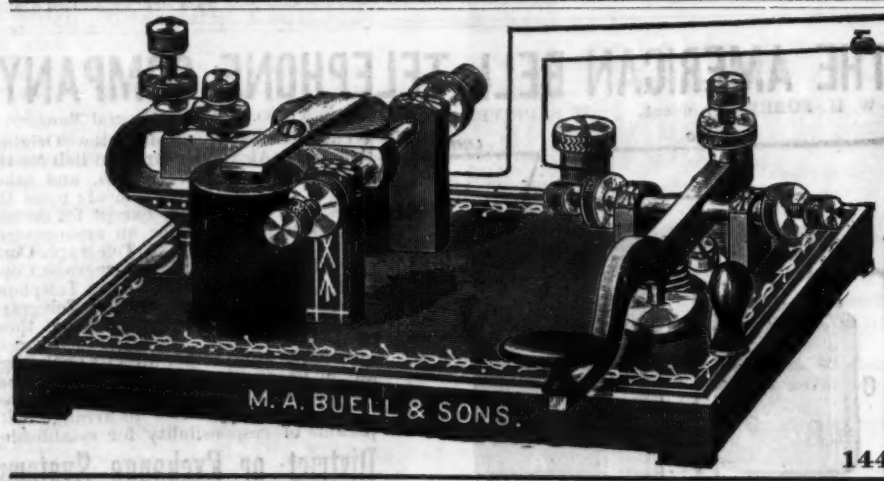


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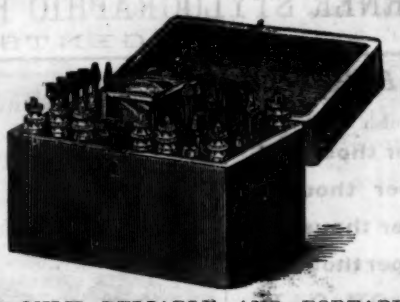

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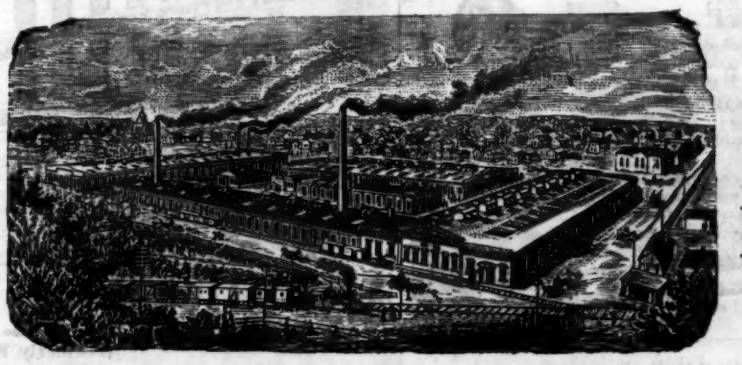

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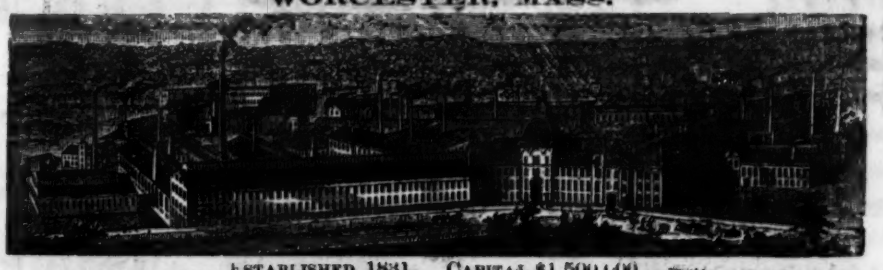

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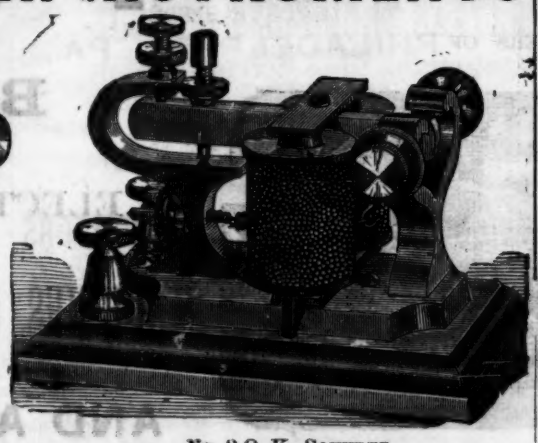

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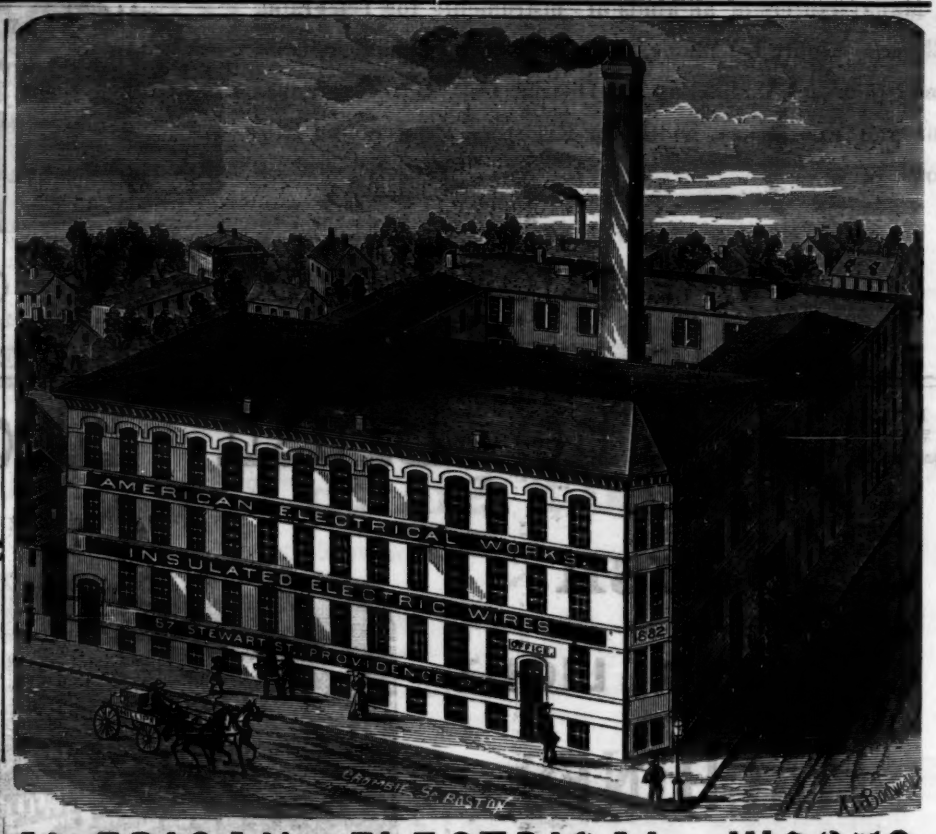


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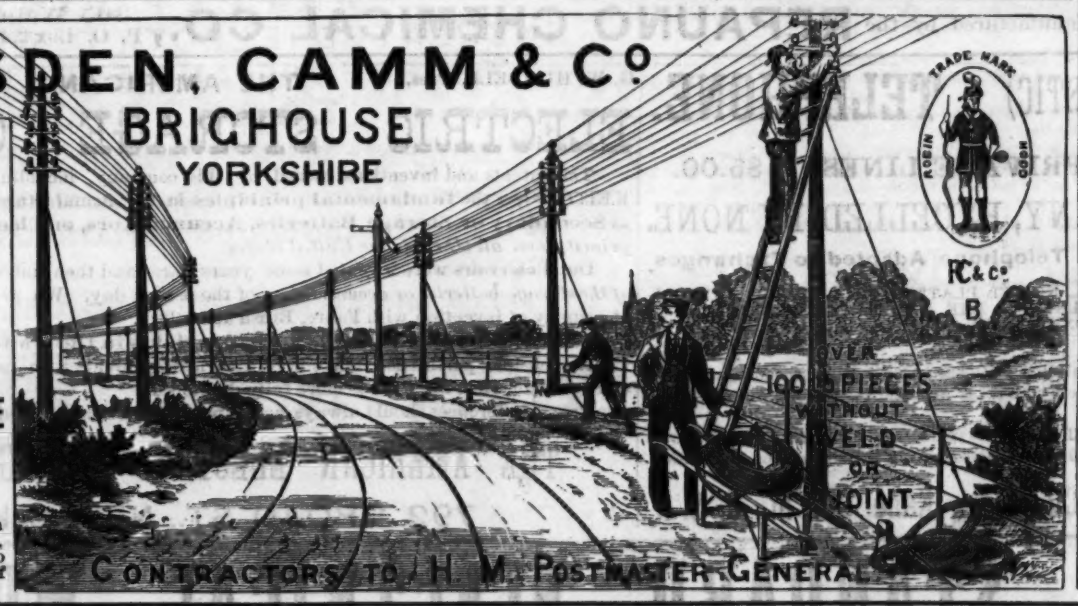


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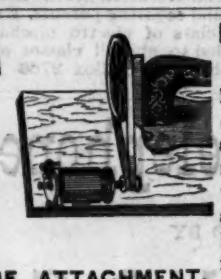

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